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PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

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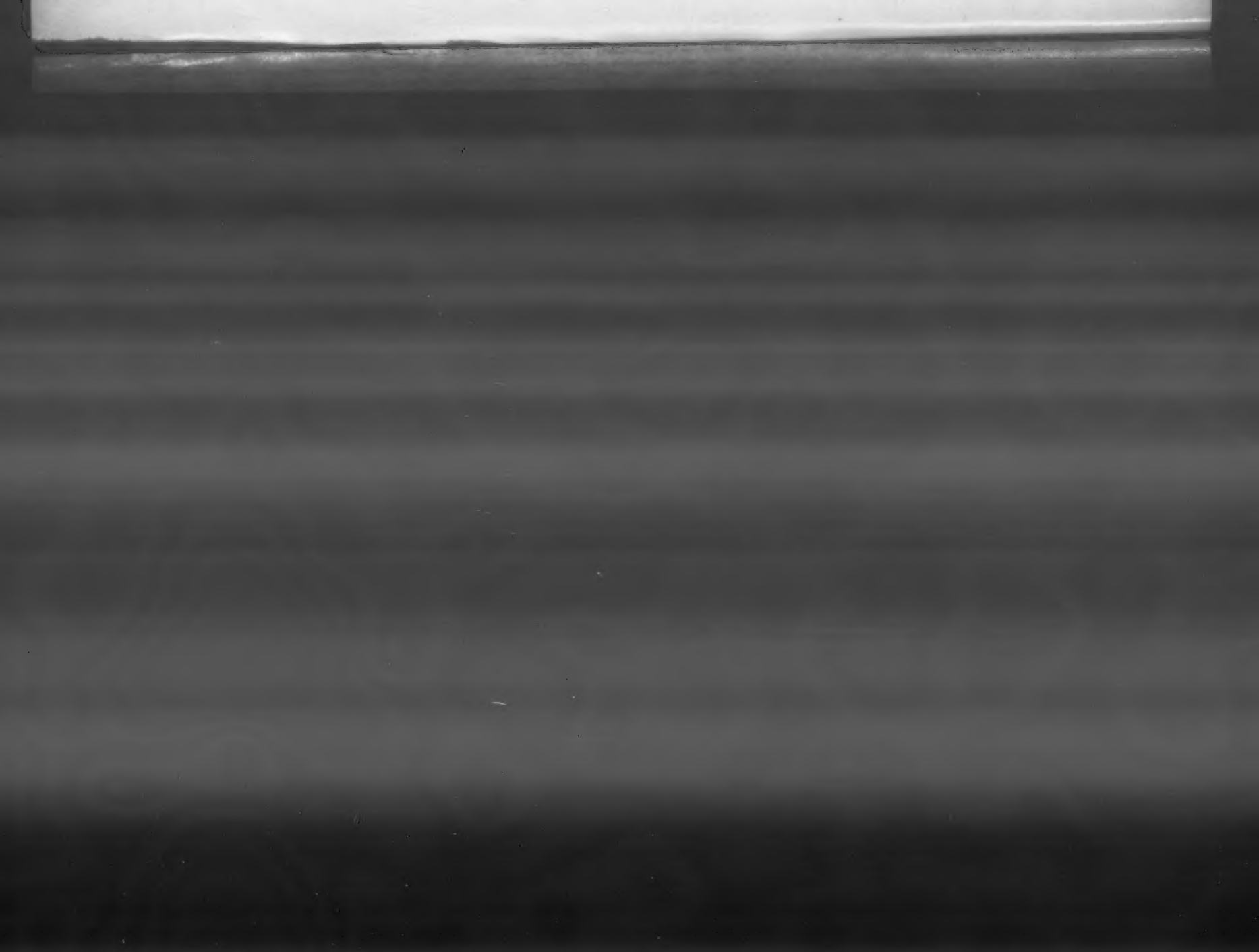

Municipal Engineering

VOLUME XIX. OCTOBER, NINETEEN HUNDRED. NUMBER 4.

A MODEL SYSTEM OF BOOK-KEEPING FOR ELECTRIC LIGHTING COMPANIES.

By John Lyle Clough.

In the August number of MUNICIPAL ENGINEERING a general survey was given of the book-keeping forms and blanks used by the Edison Light Company, of Grand Rapids, Mich. The system in use there is extremely simple, and the books used are few in number. An ordinary ledger and cash credit book are employed in connection with a special ruled "Record of Customers" and cash debit or receipt book. The former, as has already been stated, is a "short-leaf" book, and as a number of inquiries as to the details of its make-up have been received since the last article was published, a fuller description of it is here given. The short-leaf principle is not novel in many lines of business, and has been widely exploited by several companies who own patents on special applications of it in connection with a folded or creased leaf for the purpose of carrying balances forward from page to page without rewriting, though this latter feature is unnecessary in the form of book described. In size the full leaf is about 20 inches high by 17 wide, the short leaf being 20 by 11 in width. It contains 48 lines to the page, each line displaying the record of one customer for a year. One long leaf alternates with one short one throughout the book, the result being that when the book is opened and a short leaf is turned forward it still leaves exposed a portion of its companion long leaf, which portion contains a part of the record that is constant, or practically so. As a matter of fact, in this book, the portion which is thus exposed and which occupies a space the length of the book, six inches wide, is ruled into three colums—a narrow one headed "No." (of consumer), and two wider ones headed respectively "Name" and "Location." Then follows a space of about four inches assigned to the remainder of the permanent record, but which from its nature need not be at all times exposed to view. The record is a description of the character of the service, and the columns, reading from left to right, are headed as follows: "Date of Installment"—blank—"Incandescent Arc Lamps",—"T. H. Arc Lamps," "No. in Use" and "Horse Power." The remainder of the space on this page and the three following ones (two short pages and one wide one), contain the data relating to the bills for one

| CUSTOMERS | | |

year, divided into months by twelve columns. Opening the book with a long leaf exposed at the left, the long leaf will be seen to show the record of number, name, location and description of service as above, and columns for January and February. March, April and May are exposed on the short leaf to the right, which, when turned to the left displays upon the reverse side, June, July and August, while the long leaf at the right now exposed exhibits the columns for September, October, November and December; and a small one for "Remarks." The mechanical features of the book will be more clearly understood by reference to the accompanying illustration, bearing in mind, however, that in the cut no attempt has been made to preserve the true proportions of the columns.

The manner in which the book is used is that commonly followed with special column ruled ledgers or registers of its class, viz.: At the proper time each month the book-keeper goes through it, and from the records determines the amount of each consumer's bill, which is set down under the heading "Bills Rendered" for the given month. After all these entries have been made the columns are footed, the totals being carried forward from page to page; a single journal entry carries the record of the whole transaction to the general ledger, the grand total being charged to the "consumer's" account, by whatever name it may be known, as a debit, and to the "earnings" account as a credit. When payments are received they are entered in the cash book and posted individually to the different consumers' accounts in the register, and at the end of the month the grand total of receipts under "amount paid" is credited to "consumers" in the general ledger, and the footing of the "rebate" column is debited to "rebate" account in the general ledger. The general ledger is thus used only as a record of totals, and it should be necessary to carry in it only a few accounts, the most of which have but one entry or two per month. The advantage of this plan is too obvious to need further comment. The extreme ease with which this form of book may be kept in perfect condition is one of its chief claims to consideration. At any time during the month the total of "amount paid" in the register must agree with the column in the cash book showing receipts from customers for that month. If a discrepancy is discovered, it is an easy matter to locate the cause of it.

The particular book in question could be improved by ruling all amount columns with unit lines, by reducing the width of some of the columns, and consequently of the book itself, and by substituting for the short leaf a series of several perforated leaves alternating with one not perforated. The perforated leaf is better than the short one because it lends a solid writing surface on the margin of the leaf for the entering of the names and preserves the symmetry of the book for a portion of its life at least, until it become necessary to tear off the marginal surplus.

If several perforated leaves are substituted for one perforated or cut one, the names of consumers need not be rewritten but once in one, two, three or more years, if a few lines are left blank distributed throughout the book for the entry of new names. The book is, or should be, self-indexing, all names being entered in

LAYING GRANITE PAVEMENT ON BROAD STREET, NASHVILLE, TENN.

alphabetical or numerical order, whichever plan is found the most convenient.

The cash receipt book used by this same company accommodates itself to consumers' register. The leaf is sixteen inches square, and is ruled into the following columns (reading from the left), "date," "name," "number," —— blank (used for remarks), followed by three columns with blank headings under the general heading, "customers' accounts." In the blank spaces at the head of the three columns are written the names of three successive months, as—"July," "August," "September," the bills for which are in course of settlement at the time the particular page of the cash book is in use.

This is followed by four other columns designated, "rebate," "sundries," "total," and "deposits." The footings of these columns are posted as a total at the end of the month through the journal.

The card-index system is employed by this company to record the complete history of each service, the classes of service being distinguished by different colors of cards, and projecting tabs. For lack of space the data shown by but one of the cards can be given here, but it will illustrate the manner in which the idea may be applied elsewhere. The "customers' record" card contains spaces for data under the following headings, conveniently arranged for reference:

Number.
Address.
By whom wired.
Date of city inspection.
Date of our inspection.
Date connected to system.
Date disconnected.
Cause.
Amount of deposit.
Guarantor.
Rate.
No. of motors.
Size and voltage of motors.
Maker of motors.
Certificate No.
Remarks.

A description of other forms will be given in subsequent articles.

STATISTICS ON ELECTRIC STREET LIGHTING.

Mr. F.W. Cappelen, M. Am. Soc. C. E., chairman of the committee on Electric Street Lighting of the American Society of Municipal Improvements, based his report at the recent Milwaukee meeting largely on the statistics just published by the United States Department of Labor, Carroll D. Wright, Commissioner. Mr. Cappelen commends Mr. Wright's statistics as the most comprehensive ever published. Mr. Cappelen's report and the statistics referred to are given below.

To obtain the information sought after, the United States had to guaranty secrecy; therefore no names of cities or states are mentioned.

The total rated horse-power capacity of engines at the various plants was considered the best obtainable basis of comparison as to relative importance of these plants, and the following groups were adopted:

Plants having engines of under					50	horse-power.
"	"	"	"	50 to	75	"
"	"	"	"	75 "	100	"
"	"	"	"	100 "	125	"
"	"	"	"	125 "	150	"
"	"	"	"	150 "	200	"
"	"	"	"	200 "	300	"
"	"	"	"	300 "	400	"
"	"	"	"	400 "	500	"
"	"	"	"	500 "	750	"
"	"	"	"	750 "	1,000	"
"	"	"	"	1,000 "	1,500	"
"	"	"	"	1,500 "	2,000	"
"	"	"	"	2,000 "	3,000	"
"	"	"	"	3,000 "	5,000	"
"	"	"	"	5,000 and over.		

Total number of plants in United States are 2,572

private and 460 municipal, of which number 632 private and 320 municipal are included in the report.

The total investment in all plants in United States is $265,181,920 for private and $12,902,677 for municipal; and the total investment involved in the report is $112,917,815 for private, and $10,908,920 for municipal works.

The funds for municipal plants have been raised in three ways: By taxation, by transfer of moneys from other funds in the hands of municipalities, and by issuing of bonds. Generally the bonds have realized par and better.

No plants have been considered in the report that were located in towns and villages having a population of less than 1,000 by the census of 1890. About 9 per cent. of the total number of plants are in such cities.

The following table has been compiled by the writer:

Rated Horse-Power.	Municipal Plants.		Private Plants.	
	No. Plants.	Av. Total Investment.	No. Plants.	Av. Total Investment.
Under 50	9	$6,700	6	$6,000
50 to 75	28	10,000	39	11,300
75 to 100	42	9,400	36	12,300
100 to 125	53	11,400	53	14,700
125 to 150	36	16,400	39	15,800
150 to 200	43	19,100	66	27,400
200 to 300	55	32,000	98	35,200
300 to 400	25	40,700	51	60,300
400 to 500	10	59,600	39	81,400
500 to 750	9	82,000	66	113,800
750 to 1,000	4	101,600	44	191,600
1,000 to 1,500	4	165,400	34	282,000
1,500 to 2,000	2	222,300	20	390,160
2,000 to 3,000	2	793,500	20	694,260
3,000 to 5,000	1	773,181	11	1,210,600
5,000 and over	..	.....	15	2,676,500
	320	.....	632	

The following table is of interest:

It will be noticed that salaries are higher throughout in private plants, and wages somewhat higher in municipal plants. The reason is that probably men of greater ef-

F. W. CAPPELEN. M. Am. Soc. C. E.

ficiency are engaged as officers in private plants and that more laborers and shorter hours is the rule in municipal plants.

Depreciation varies greatly, and it would be impossible to group it on a basis of averages. Taxes are generally not charged

AVERAGE COST OF SALARIES AND WAGES PER PLANT.

Plants Having Engines With Rated Horse-Power.	Private Plants.			Municipal Plants.		
	Number Reporting.	Average Cost Per Plant.		Number Reporting.	Average Cost Per Plant.	
		Salaries.	Wages.		Salaries.	Wages.
Under 50	6	$261 66	$450 00	5	$102 60	$682 00
50 to 75	33	581 00	784 70	15	258 00	984 13
75 to 100	29	558 86	835 41	27	358 78	824 22
100 to 125	41	697 07	1,002 90	41	428 17	846 85
125 to 150	32	740 59	1,053 28	27	579 11	1,006 41
150 to 200	58	857 93	1,499 56	31	587 23	1,288 74
200 to 300	86	1,092 81	1,959 42	48	826 63	2,116 79
300 to 400	44	1,711 95	3,232 09	21	1,005 38	2,822 24
400 to 500	39	2,269 26	3,843 59	9	1,063 00	4,760 33
500 to 750	65	2,592 35	5,150 29	9	1,135 78	4,292 22
750 to 1,000	44	3,738 20	8,494 27	3	1,726 33	6,766 33
1,000 to 1,500	34	4,744 12	10 026 00	4	3,785 00	11,425 50
1,500 to 2,000	20	5,611 00	14,082 10	2	3,675 00	17,421 50
2,000 to 3,000	20	9,889 30	23,064 65	2	6,966 00	47,566 00
3,000 to 5,000	11	15,150 64	26 422 27	1	8,493 00	12,318 00
5,000 and over	14	35 462 86	69.146 50	..	.....	.....

in municipal plants. The writer finds that the estimated total depreciation per 900 plants on the average is 5.6 per cent. Land values not considered.

AVERAGE PRICE PER KILOWATT HOUR CHARGED IN ARC SERVICE.

Rated Horse-Power.	Private Plant.				Municipal Plant.			
Under 50	1	$0.1028	3	$0.1258	1	$0.0815	6	$.0719
50 to 75	19	.1146	22	.0861	10	.1100	18	.0631
75 to 100	18	.0986	21	.0868	10	.0822	20	.0499
100 to 125	23	.0940	34	.0770	15	.0776	26	.0433
125 to 150	17	.0892	24	.0798	12	.0684	31	.0376
150 to 200	38	.1291	47	.0846	16	.0862	29	.0397
200 to 300	58	.1075	72	.0710	31	.0821	42	.0451
300 to 400	40	.0906	40	.0659	11	.0788	24	.0408
400 to 500	27	.1000	33	.0657	3	.0556	9	.0430
500 to 750	57	.1046	54	.0696	6	.0139	7	.0406
750 to 1,000	38	.0939	35	.0629	1	.0833	4	.0337
1,000 to 1,500	31	.1056	32	.0698	4	.0521	3	.0418
1,500 to 2,000	15	.1299	20	.0709	1	.1126	2	.0283
2,000 to 3,000	18	.1157	18	.0664	..	....	2	.0381
3,000 to 5,000	9	.1202	11	.0574	1	.0382	1	.0264
5,000 and over	10	.1400	12	.0596	..	....	..	.....

To prices charged by municipalities and also to their cost price should be added about $0.03 for taxes based on estimates made by assessors, also interest and office expenses, so as to have true comparison between public and private charges.

This table shows that the municipalities charge less to private consumers than private plants do, also that the price charged by private plants to municipalities is greater than the cost per kilowatt hour to the municipalities when *furnished by the municipality itself*.

The following table shows average price per lamp per year of arc lighting by hours of service rendered. All lamps on a meter service and those in irregular service are not herein contained.

AVERAGE PRICE PER LAMP PER YEAR OF ARC LIGHTING BY HOURS OF SERVICE RENDERED.

Hours of Service per Year.	Private Plants.				Municipal Plants.			
Under 500	197	$43 74	2	$11 25	11	$31 64	.....	.....
500 to 750	335	54 64	3	72 00	75	44 19	213	$18 10
750 to 1,000	259	58 31	20	37 50	51	39 18	46	52 32
1,000 to 1,250	1,938	69 87	672	58 13	85	54 98	477	27 49
1,250 to 1,500	2,226	79 20	327	90 78	362	59 09	433	55 78
1,500 to 1,750	3,666	98 13	520	71 56	136	47 99	671	36 20
1,750 to 2,000	3,001	76 08	966	67 76	345	52 48	677	37 61
2,000 to 2,250	4,096	101 16	7,382	81 51	580	63 18	5,141	39 73
2,250 to 2,500	1,535	117 88	1,649	86 17	26	67 90	761	52 57
2,500 to 2,750	831	93 81	2,262	85 05	52	69 50	1,763	57 17
2,750 to 3,000	205	76 86	129	74 99	12	47 50	1,198	43 76
3,000 to 3,250	211	63 41	4,023	105 80	54	60 85	2,173	45 76
3,250 to 3,500	156	159 32	414	94 12	22	50 00	227	34 66
3,500 to 3,750	436	91 42	2,854	93 99	81	84 52	1,006	54 71
3,750 to 4,000	1,9 6	123 90	21,246	100 60	147	129 95	5,264	63 57
4,000 and over	2,044	149 54	25,636	101 97	73	65 26	2,669	58 56

This shows that municipal plants charge less than private plants to private customers.

AVERAGE PRICE OF INCANDESCENT SERVICE PER LAMP HOUR TO PRIVATE USERS.

Rated Horse-Power.	Private Plants.		Municipal Plants.	
	No. Reporting.	Average Price Per Lamp Hour.	No. Reporting.	Average Price Per Lamp Hour.
Under 50	..	.....	..	.....
50 to 75	1	$0.0100	2	$0.0057
75 to 100	3	.0100	4	.0060
100 to 125	6	.0096	2	.0045
125 to 150	2	.0113	6	.0044
150 to 200	7	.0093	6	.0055
200 to 300	8	.0092	10	.0068
300 to 400	3	.0098	..	.....
400 to 500	5	.0090	3	.0367
500 to 750	6	.0081	..	.....
750 to 1,000	2	.0090	..	.....
1,000 to 1,500	7	.0086	..	.....
1,500 to 2,000	1	.0075	..	.....
2,000 to 3,000	2	.0067	..	.....
3,000 to 5,000	1	.0100	..	.....
5,000 and over	4	.0081	..	.....

With one exception, the prices charged private users by municipalities are smaller than charged by private plants; the same is also the case between prices charged by private plants to municipalities and the cost where the municipality furnishes its own service.

As very little has ever been said in the society with reference to incandescent lighting, the following tables are presented:

AVERAGE PRICE PER 16-CANDLE POWER LAMP PER YEAR CHARGED IN UNMETERED INCANDESCENT SERVICE.

Rated Horse Power.	Private Plants.				Municipal Plants.			
Under 50	3	$5 23	3	$5 65	3	$8 09	4	$8 63
50 to 75	25	7 50	16	8 40	11	5 16	9	10 09
75 to 100	25	6 20	21	10 21	20	5 35	14	6 97
100 to 125	43	6 19	..	..	35	4 62	23	5 08
125 to 150	31	6 32	22	7 76	20	4 57	22	4 58
150 to 200	46	7 02	39	10 06	24	5 38	26	5 97
200 to 300	60	6 42	50	10 55	28	5 61	30	4 45
300 to 400	25	5 89	27	11 11	18	8 19	15	4 34
400 to 500	21	7 90	22	12 76	8	3 11	7	5 56
500 to 750	31	7 32	32	10 28	..	....	..	....
750 to 1,000	20	7 56	21	10 31	5	2 56	6	4 36
1,000 to 1,500	13	6 97	20	11 98	..	....	3	3 91
1,500 to 2,000	5	5 88	6	8 49	3	6 00	4	3 32
2,000 to 3,000	8	11 53	8	10 82	1	3 93	2	3 77
3,000 to 5,000	2	10 64	3	7 40	..	....	1	11 44
5,000 and over	3	4 46	3	11 67	..	3 63	..	.....

Private parties are charged more, considerably, by private plants than by municipal plants, and municipal cost is a great deal less than charged municipalities by private plants.

AVERAGE PRICE OF INCANDESCENT SERVICE PER KILOWATT HOUR TO PRIVATE USERS.

Rated Horse-Power.	Private Plants.		Municipal Plants.	
	Number Reporting.	Av. Price Per Kilowatt Hour.	Number Reporting.	Av. Price per Kilowatt Hour.
Under 50	1	$0.2000	2	$0.1250
50 to 75	9	.1667	4	.1650
75 to 100	7	.1871	11	.1264
100 to 125	16	.1559	23	.1173
125 to 150	15	.1466	13	.1146
150 to 200	36	.1552	24	.1160
200 to 300	28	.1646	27	.1132
300 to 400	32	.1662	11	.1162
400 to 500	26	.1526	2	.1250
500 to 750	34	.1197	3	.0800
750 to 1,000	32	.1589	1	.0910
1,000 to 1,500	25	.1538	3	.0663
1,500 to 2,000	18	.1555	1	.0900
2,000 to 3,000	10	.1253	....	.....
3,000 to 5,000	8	.1406	1	.0450
5,000 and over	9	.1536	....	.....

This shows that the prices of cities is less in every case than by private plants.

AVERAGE PRICE OF INCANDESCENT SERVICE PER AMPERE HOUR TO PRIVATE USERS.

Rated Horse-Power.	Private Plants.		Municipal Plants.	
	Number Reporting.	Av. Price per Ampere Hour.	Number Reporting.	Av. Price per Ampere Hour.
Under 50	...	.....	..	.....
50 to 75	1	$0.0075	3	$0.0065
75 to 100	3	.0106	1	.0050
100 to 125	7	.0083	4	.0073
125 to 150	2	.0125	2	.0071
150 to 200	7	.0083	7	.0068
200 to 300	11	.0105	8	.0066
300 to 400	6	.0080	4	.0113
400 to 500	2	.0085	2	.0063
500 to 750	17	.0100	2	.0075
750 to 1,000	8	.0077	1	.0075
1,000 to 1,500	4	.0097	..	.....
1,500 to 2,000	4	.0106	..	.....
2,000 to 3,000	6	.0099	..	.....
3,000 to 5,000	1	.0050	..	....
5,000 and over	3	.0058	..	.....

Prices charged by municipalities are less than by private plants in all cases but one.

The total number of arc lamps reported (summarized by the writer) in service is 144,404. Of these, 133,820 are the so-called open lamps, and 10,584 are enclosed; 90,075 open and 1,241 enclosed lamps are in municipal service; 43,745 open lamps and 9,343 inclosed in private service.

IMPROVEMENT OF WATER SUPPLIES.*

By G. Bouscaren, C. E.

One of the characteristics of municipal work at the present time is the activity being displayed in the improvement of water supplies. This movement is not confined to large cities, and is noticeable in Europe as well as in the United States. It is an indication of the growing attention given by the people to the discoveries of science, in their application to the material development of civilization. The time is past when the muddy waters of our western rivers could be considered as a wholesome combination of food and drink, and everyone is aware now of the danger lurking in a sparkling water of doubtful origin.

Quality has become one of the most, if not the most important factor in all schemes of water supply. Enthusiasts are even found in the ranks of engineers and scientists who advocate nothing short of complete sterilization. Distillation has been suggested, and treatment by ozone is being experimented upon in France and Germany. The cost of sterilization is prohibitory; the ozone process is complicated and expensive in itself, and would not dispense with clarification in the case of turbid water. From a practical point of view these refinements can hardly be considered as necessary in the great majority of cases, for the reason that bacteria which are detrimental to human health are only found in waters which have been subject to contamination, and they constitute but a small percentage of the whole.

The essential requisites in water to be used for domestic purposes can, I think, be concisely expressed as follows:

Absence of disease germs.

Absence of solid matter in suspension.

Absence of color, taste and odor.

Absence of dissolved matter injurious to health, and objectionable for cooking, washing and boiler feeding.

Such waters were originally found almost everywhere in this country before its forests had given way to plowed fields, and before the white man had spotted the banks of its streams with large centers of population. As a rule we must now go to the mountains to find pure water. New York and Boston in this country; Liverpool, Birmingham and Manchester in England; Paris and Vienna on the continent, have spent and are spending immense sums to bring spring or impounded surface water from mountain slopes to their people, over long and expensive acqueducts. Other cities are satisfied with purifying artificially the water of streams upon which they are located. Preference is generally given to the first solution, where practicable, sometimes at a cost

* Read before the annual meeting of the American Society of Municipal Improvements, at Milwaukee, in August, 1900.

very much greater than that of artificial purification. This preference is due, in many cases, to an excess of confidence in rills and springs, and a holy distrust of filters and coagulents.

The fact is that springs—large ones especially—are not above suspicion, polluted streams having been known to appear under this disguise after a short journey through a range of hills. Furthermore, the protection from undue pollution of a watershed of large area, even in a mountainous district, is not an easy matter to accomplish. Close watchfulness and constant vigilance will not always avoid occasional failure. On the other hand, methods of artificial purification are now so well understood as to place the character of the effluent under the absolute control of the operators, provided no mistake be made in the method of treatment—a condition easily realized by means of preliminary investigation in competent hands.

LAYING MASONRY AND RIVETING STEEL ON BROAD STREET VIADUCT, NASHVILLE, TENN.

It has been argued by advocates of complete sterilization that because bacterial life is not entirely removed by the methods of artificial purification now in use, the water so treated must therefore be regarded as objectionable. The answer to this is that the percentage of bacteria left in the water after treatment need not be more than 1 per cent.; that the chances of disease being communicated through the water are therefore reduced by 99 per cent., which is certainly an acceptable improvement until a practical method of sterilization at reasonable cost has been found.

Two systems of purification have been widely and successfully applied to the treatment of water supplies. They are generally known as the English and the mechanical filtering systems. For a brief description of these systems I will quote from a recent report addressed to the board of trustees, "commissioners of water-works," of Cincinnati by the consulting engineers and myself:

The English system, so-called because it

was first applied in England for the purification of the London water supply, is now largely and successfully used on the continent of Europe, and has received a limited number of applications in this country, the most recent being the filters at Albany, N. Y., completed last year.

This system consists in the slow filtration, through sand, of water previously relieved by sedimentation in settling basins, of a large proportion of such solid matter as it holds in suspension. It was first devised as a clarifying process, but it is generally admitted now that the high degree of purification obtained is partly due to the active bacterial life which prevails in the deposit formed on the surface of the filter beds, and in the gelatinous films which coat the sand grains in the filters after a short period of operation. When the resistance to the passage of water through the surface-deposit has increased to such an extent as to seriously diminish the output, this deposit, and a thin layer of the underlying sand, are removed by scraping. This procedure is renewed until the sand-layer is reduced to the thickness of about one foot, when the original thickness is restored by the addition of pure sand.

Essential requisites for the successful operation of this system are:

First. The preliminary treatment of the water by sedimentation, to reduce the amount of suspended matter below a certain limit, and to avoid too frequent scrapings.

Second. A low and regular rate of filtration, varying from two to four million gallons per acre per twenty-four hours.

Third. The avoidance of all disturbance in the sand layer, or of its covering; such disturbance being invariably the cause of a deterioration in the quality of the effluent.

The mechanical system, sometimes called the American system, from the fact that it originated and is mainly applied in America, was also devised purely as a process to clarify water used for manufacturing purposes. As now improved and used extensively for the purification of water supplies for cities and towns in this country, it accomplishes practically the same results as the English system, when operated under proper management.

It consists of the rapid filtration of the water through a body of sand in a closed or open tank. When clogged by the accumulation of sediment, the sand is washed by an injection of pure water in reverse direction. The impurities are carried away by the wash-water, whilst the sand is thoroughly loosened by mechanical agitation.

A necessary feature of this system, when designed to remove the bacteria as well as earthy matter in suspension, is the use of a chemical re-agent capable of producing a gelatinous precipitate which will arrest the bacteria on and near the surface of the sand layer and prevent their passage through the filters. Another essential condition is that the chemical used as a coagulent shall leave the effluent free from the presence of all objectionable substances. When the raw water is quite turbid, its preliminary treatment by sedimentation is indispensable to secure satisfactory and economical results. The rate of filtration in this system is fully forty times greater than in the English system.

In the English system purification is effected through mechanical and biological agencies, generally without the use of chemicals. The rate of filtration is slow; the operation of the filters is intermittent; and the sand is washed outside the filters. In the American system the operation is mainly mechanical; the use of a coagulent is imperative; the rate of filtration is rapid; the operation of the filters is continuous, excepting the short interruption incident to washing; and the sand is washed in the filters.

All waters are not equally amenable to treatment by these two systems, and the character of the water is also an important factor in the cost of operation. Hence an essential requisite for success is a thorough investigation of the character of the water to be treated, and of the applicability and cost of each of the two systems through comparison of results obtained elsewhere under similar conditions, or, where this is not practicable, through the operation of experimental plants, as has been done in Louisville, Pittsburgh and Cincinnati.

RECENT PROGRESS IN SEWAGE PURIFICATION IN ENGLAND.

One of the valuable papers read before the Milwaukee meeting of the American Society of Municipal Improvements was by Mr. Gilbert J. Fowler, M. S. C., F. I. C., superintendent and chemist Manchester Corporation Sewage Works, on "Recent Progress in Sewage Purification in England." Mr. Fowler spoke of work of which he has been in charge or has intimate knowledge.

The first experiments on biological methods of sewage treatment were those of Mr. Dibdin.

The Barking filter of coke breeze is typical of many others which have succeeded it. The coarse material would allow liquid to flow through too rapidly, so the outlet is stopped and the filter is filled and allowed to stand, say, two hours, and the purified sewage let out, the bed being filled again after a period of rest. A million gallons of effluent from a chemical precipitation tank can be treated on an acre of coke breeze.

The Roscoe filters at Manchester were of graded coke and clinker, from several inches size of pieces at bottom to one-eighth inch diameter at top, covered with 3 inches of gravel; total depth 3 feet and area 3 square yards. They have been working five years at a rate of 700,000 gallons an acre per day. A thick soil has developed on top of the bed.

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The Sutton experiments pass crude sewage on a bed of coarse lumps of burnt clay, thence, after an hour or more of contact, to a lower bed with finer particles of coke breeze, where, after some period of contact, the effluent was efficiently purified.

The chemical changes in these beds are made by aerobic organisms very largely, and are largely a process of alternate nitrification and denitrification.

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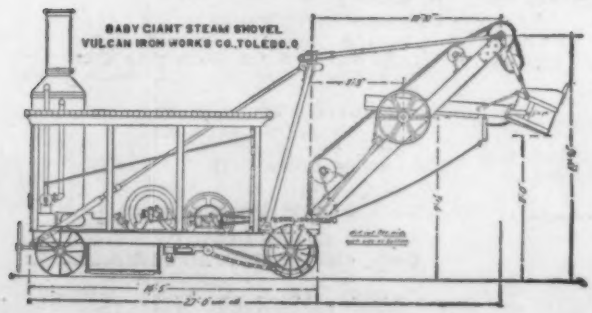

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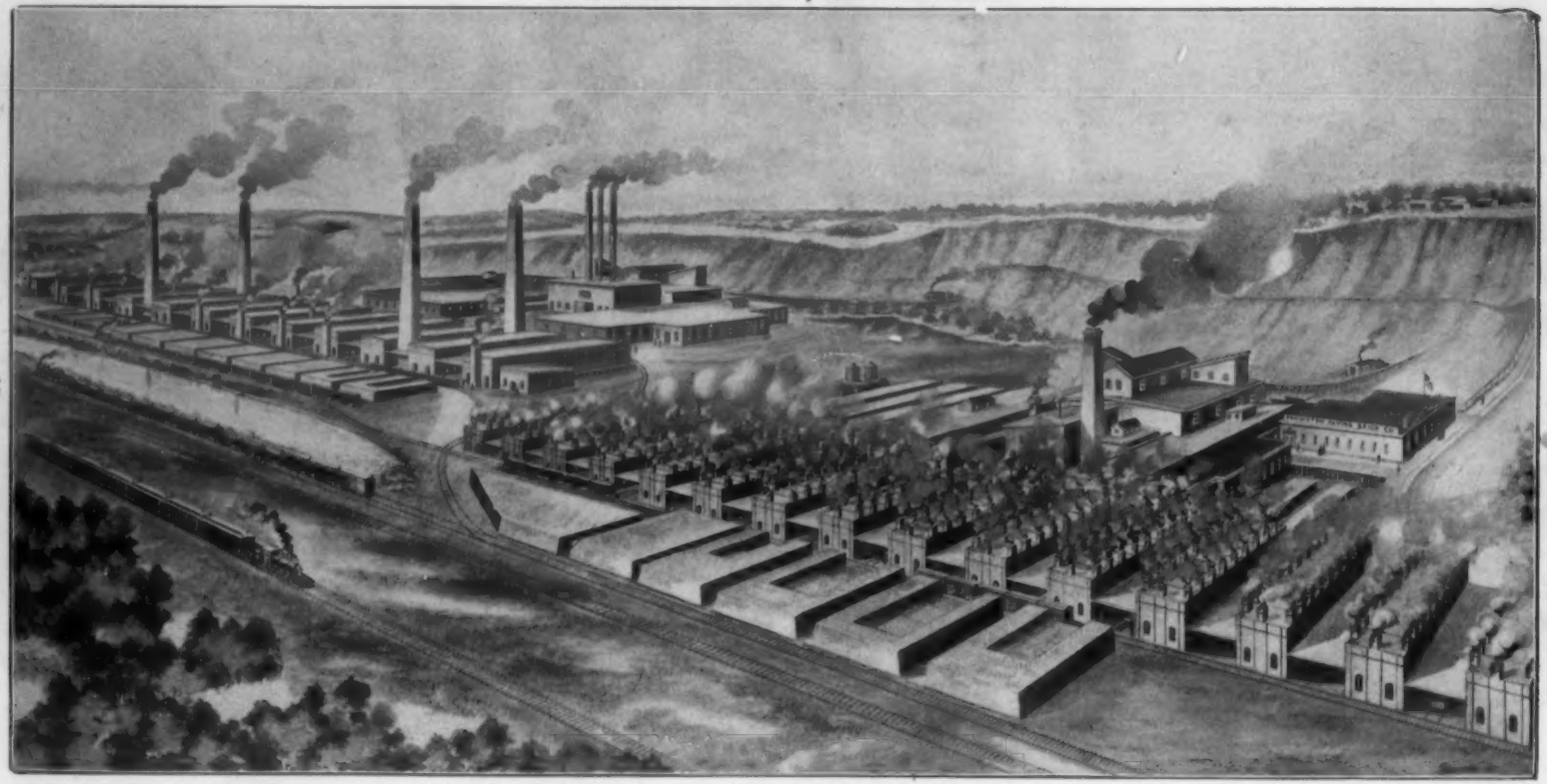

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See adv. in back of this Magazine

CHURCH STREET VIADUCT, NASHVILLE, AFTER COMPLETION.

About 1895 Mr. Cameron patented the covered septic tank, through which the sewage flows slowly, depositing solid matters. In time a vigorous anaerobic fermentation begins, producing solution of suspended matters, gas, and a thick scum. The effluent is further purified by filtering through clinkers or coke breeze. The patents also cover automatic mechanisms for managing the discharges. Other such mechanisms are Adams' and Ridgway's.

Stoddart's filter at Bristol is similar, except as to method of distribution of sewage on the bed by dropping through perforations in cover of bed. These continuous filters will treat three to eight million gallons of sewage a day.

All the methods mentioned are efficient, but are on a small scale. The questions unanswered as yet are: How effective will they be on large scale? Must they be renewed frequently?

Mr. Fowler carried out experi-

LAYING CREOSOTED TIMBER FLOOR ON BROAD STREET VIADUCT, NASHVILLE, TENN.

Ducat's filters at Sutton and Hendon work on the principle of continuous nitrification. The filter is 8 feet deep, of alternate layers of clinker and aerating layers of pebbles and pipes, through which air may be forced.

Whittaker and Bryant have a continuous coke filter at Accrington, on which the sewage is sprayed by revolving sprinklers. The bacterial action is hastened in cold weather by heating the sewage sufficiently.

ments under Frankland, Perkin and Latham, at Manchester, on

1. Treatment of raw sewage on bacteria beds by double contact.

2. Treatment of settled sewage on bacteria beds by double contact.

3. Experiments with open and closed septic tanks, and treatment of the effluent on bacteria beds by single contact and also double contact.

4. Experiments on the purify-

CONSTRUCTING A CONDUIT OVER A WATER PLANT UNDER BROAD STREET, NASHVILLE; ALSO SHOWING 15-IN. SEWER PIPE.

ing effect of dissolved oxygen and nitrates in the filtrates.

5. Experiments on storm water.

The conclusions in the various experiments are as follows, using the same numbers as above:

1. With silt and detritus in the sewage, preliminary settlement is necessary to prevent choking. There were no injurious effects from the manufacturing wastes met with. This may not be true elsewhere.

WEST APPROACH, CHURCH STREET VIADUCT, NASHVILLE, TENN., SHOWING FLOOR CONSTRUCTION.

3. Tanks were worked at a rate equal to their capacity in twelve hours, as the maximum possible for effective work. Double this tank capacity should be provided. Opened and closed tanks gave the same results, the scum acting as a cover. No nuisance is created. Sand, grit, etc., are deposited in the tank, also sulphide of iron from some manufacturing wastes. This latter substance gives less trouble at Leeds and Manchester than at Wolverhampton. In the two former, with tank capacity equal to twenty-four hours' flow, about 50 per cent. of the sludge can be destroyed in the septic tank, and the tank does not require cleaning more than once a year. With purely domestic sewage the period would be much longer.

A single filtration through a coke bed is sufficient for effluent from septic tank. To prevent choking of beds suspended matters must be arrested by catch pits or the septic tank; the beds must be constructed of fairly fine material, the effluent must be admitted on the bed in a thin sheet, the bed must not be disturbed below the top layer of finest material; besides the usual rests there must be occasional periods of several days, surface accumulations must be removed and the top layer occasionally replaced. The filter can then be maintained at a rate equal to one-third the volume of the tank per day, or say at the rate of 500,000 gallons of septic tank effluent per acre per day, allowance having been made for rest periods.

The results from contact beds

acting as described, and continuous filters, as previously described, are quite similar, local conditions probably deciding which shall be adopted.

The first flush of storm water should be treated as thoroughly as possible, the later flow being treated less carefully. Twenty-five acres of roughly constructed beds will be required for Manchester, being operated sufficiently all the time to be ready for action when storm water comes.

The nitrates formed can be utilized to increase the work of the bed.

THE NEW SEWER OUTFALL AT BURLINGTON, IOWA.

The city of Burlington, Iowa, was visited by a severe rain storm on August 15, 1898, which did considerable damage, the greatest of which was the destruction of the spillway

EMMET STEECE,
City Engineer, Burlington, Iowa.

at the mouth of the Valley street sewers. The outlet of these sewers has been a great source of expense to the city, the spillway having been destroyed twice before. The quantity of water discharged at the time of the last washout was sufficient to tax the two parallel sewers, one of 10-foot span, the other of 12-foot span, to their full capacity; the velocity of water being about twenty feet per second, the slope from a point 150 feet west of the portal being 1.66 per cent.

A fair conception of the last structure which failed can be had upon examination of the plans in connection herewith. It consisted of a stone spillway 25 feet 6 inches in width and extending about 100 feet east of the portal; the side walls were 4 feet thick throughout. The bottom was formed by paving stones set on edge upon one layer of 3 x 12 pine planks, which in turn rested upon stones thrown in at random around a few piles. The destruction of this flume was most complete, nearly the whole of it having been thrown out a distance of 150 feet into the river. Stones containing 15 cubic feet were carried bodily out into the channel of the river by the force of the flow.

To rebuild the outfall on similar lines being out of the question, Mr. Emmet Steece, the city engineer, was requested to prepare plans and specifications for a new structure. Several plans and suggestions were submitted and the plan here given was recommended and accepted by the city council and the work ordered.

In the preparation of the plan it was thought advisable to provide some means to break the force of the current, and for that reason

the invert was built with two short breaks or falls, followed by very slight slopes. It was also necessary to have the outlet covered as far out as possible in order to do away with the objectionable features naturally connected with an open spillway on the levee immediately in front of the business portion of the city. For this reason, in addition to procuring more high ground on the levee, the form here shown was designed.

The work was done under three separate contracts—not the best way to do one job—but fair results were obtained in this instance.

The first contract was for the substructure or foundation. This was built as shown on the plan, viz., a bed of concrete on piles and riprap. The piles were required to be of young oak, reasonably straight, the bark stripped off, not less than 8 inches thick at small end, not less than 12 inches or more than 15 inches at the large end, pointed to 4 inches square, except where shoes were used. Piles were driven until the sinking was not more than three-fourths of an inch under the blow of a 1,500-pound hammer falling 15 feet. The total number of piles driven was 438, of an average length of 13.7 feet. The cost to the contractor was about 25½ cents per foot left in place.

The following form of record was used:

ROW NO. 1.

Pile.	Length Before Driving.	Length Sawed Off.	Net Length In Place.	Height of Fall Last Blow.	Penetration Last Blow.
A	16 feet.	0 0	16 ft.	15 feet.	½ inch.
B	20 feet.	1 ft. 6 in.	18 ft. 6 in.	16 feet.	⅝ inch.

Riprap was required to be hard limestone from ½ cubic foot to ½ cubic yard in size compactly laid by hand, voids filled with gravel, and water excluded while work was being carried on. The cost to the contractor for labor in depositing riprap in this manner was about 33 cents per cubic yard, not including cost of pumping.

The concrete was mixed in the proportion of one part Portland cement, 2½ parts sand and 5 parts broken stone, deposited and rammed in layers not less than 4 inches nor more than 8 inches in thickness, water being excluded 48 hours after concrete was in place. The temperature limit was 40 degrees Fahr. The cost to the contractor for labor in depositing concrete was about $1.16 per cubic yard, not including cost of pumping. Foundation contract was completed November 17, 1899.

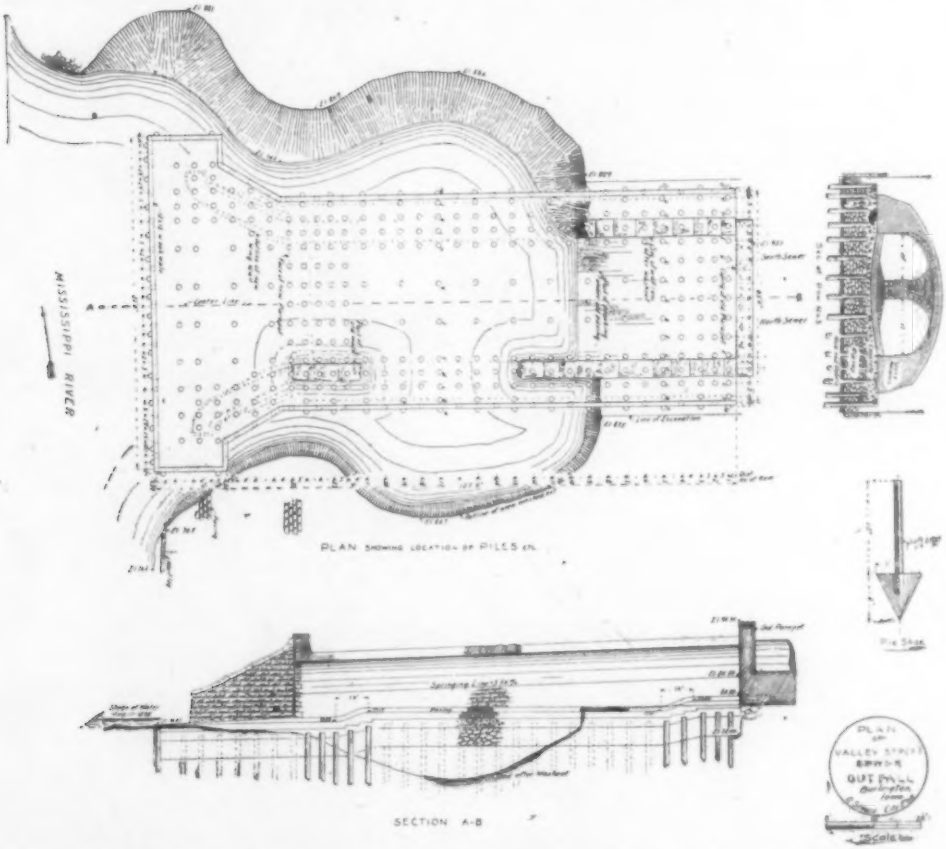
The contract for the face work of the wing walls and parapet, also the coping, was let in advance of the contract for the main superstructure to save time. Bedford stone was specified for this work, from 10 inches to 16 inches in thickness cut to ⅜-inch points for 12 inches back of the plane of the face joints, and to 1-inch overlying the backing, pitch-faced with no projection exceeding 2½ inches, nor no depression back of the plane of the face-joints. The ring stones were cut as shown on the plan, corner lines run with 1½ chisel draft on each side thereof. Coping bush hammered on the exposed faces, cut to ⅜-inch joint on bed, each stone to have two holes

to receive 1-inch iron dowels. Facing was laid in natural cement mortar; the joints cleaned out to a depth of 1½ inches before pointing.

The contract for the main superstructure, including the paving, was let to O. M. Burrus, of Burlington, who also had the contract for the face work and coping. For this work local limestone was used. The stone composing the arch sheeting and the face of the abutment walls were of seasoned stone, cut to one-half-inch joints for 12 inches back from the face, laid in natural cement mortar and pointed with Portland cement mortar.

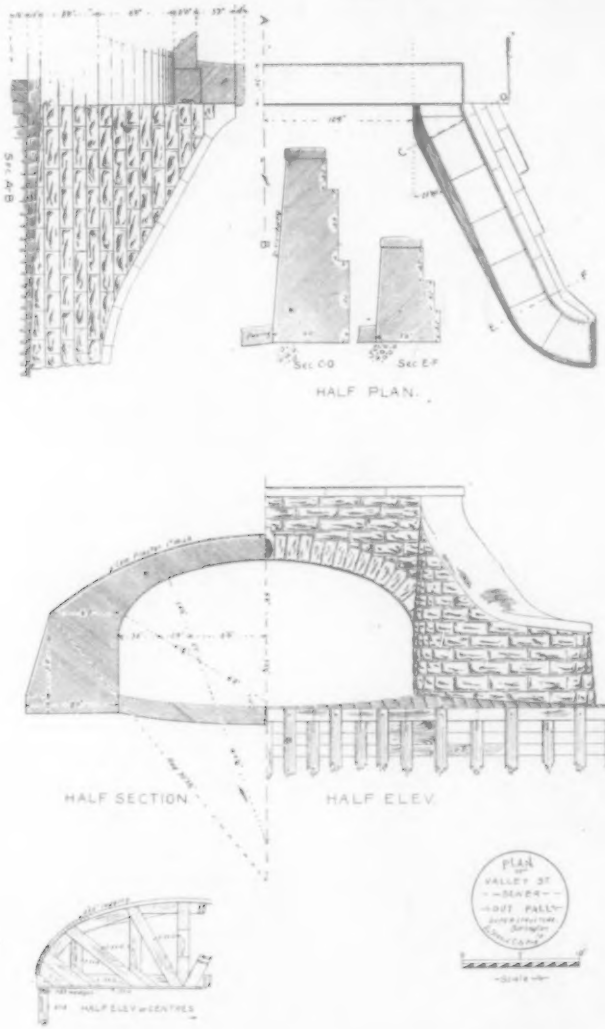
The work on this last contract was done almost entirely during the winter months, advantage being taken of every day to work when the temperature was above 36 degrees Fahr. This work was pushed with much vigor on the part of the contractor.

The centers were allowed to remain two weeks after the completion of the first 32 feet section, but were removed immediately upon completion of the last section, and no noticeable settlement in the arch occurred. The centers were built for use without intermediate posts and were found to be unusually rigid.



The cost of labor to the contractor on the last contract was, for cutting, 57 cents; laying, 53 cents, and for helpers, 64 cents, the cost of pumping below the springing line of the arch not included. The

cost of labor in each case is calculated from the time as reported by the inspectors, who were required to furnish the city engineer with a complete memorandum of each day's work. The cost of the entire work included in the three contracts was $22,419.24, and the work was completed June 20, 1900.



THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

SPECIFICATIONS FOR THE USE OF ROAD ROLLERS.

1. Where an electric street railway is being constructed in a village street and the lower course and surface coat are composed of broken stone, is it customary or good practice to roll either or both these layers with a 5- or 6-ton asphalt roller?

2. Can the term "road-roller" be properly used to designate a 5- or 6-ton asphalt roller? Where the term "steam road-roll-

er" is used in the specifications, could it be fairly interpreted to mean an asphalt roller of any weight whatever?

3. Where the franchise granted by a village to an electric street railway recites that the work must be done under the direction of and to the satisfaction of the village engineer, and he rejects a 5- or 6-ton asphalt roller as insufficient to do the work properly, and requires a road-roller weighing not less than 10 tons, is that requirement a reasonable one? I desire this for the information of our village council.

L. W. Mathewson, C. E.,
4222 Chambers St., Cincinnati, O.

1. This depends somewhat upon local conditions and the manner of applying the layers of stone and rolling them. It is sometimes impossible to use a heavy steam roller in compacting a subsoil which can be consolidated satisfactorily by thorough rolling with a lighter machine. On such soil it might be advisable to use the lighter roller until a sufficient thickness of broken stone was reached to bear the heavier roller. In such case the stone should not be put on to the entire specified thickness at once, but should be added gradually, and rolled frequently as it is unloaded and spread. By applying the stone, and rolling it as applied in this manner, in any case it is possible to make a compact layer, especially if sand or fine screenings are worked in and water is sprinkled on judiciously. A light roller will have little effect on a layer, say six inches in thickness. Even with a heavy roller, the continuous method of applying and rolling the stone will materially improve the compactness of the layer.

2. An asphalt roller is not a steam road roller in the ordinary acceptation of the term.

3. The provision in contracts and franchises that work shall be done under the direction of, and to the satisfaction of, the municipal engineer means as near what it says as the city council or village board, or board of public works, desires. His requirements must be reasonable and, with the consent of the board, he can stop the work until the question of their reasonableness is decided. The requirement of a ten-ton road roller is not unreasonable under a specification as stated if there are no other requirements which make a large roller unmanageable. But, as above suggested, there are other methods of securing the same result. What is wanted is a compact layer of stone. Perhaps this can be secured equally well without forcing a contest over a specification which is not of the utmost definiteness.

A roller heavy enough to secure the specified result can be insisted upon. Many cities specify the weight of roller, or better the weight actually resting on the main roller per inch of length, also the length of time the layer shall be rolled, in which case there can be no question. Possibly heavily loading the small roller will help to settle the difficulty, together with thin layers and more frequent passage of the roller over them. Good work must be insisted upon, and the engineer is fully justified in requiring everything possible under the specifications which is necessary to secure it. In fact his duty demands that he do so.

DISTILLATION OF WATER SUPPLY.

A city has the choice between a supply of 500,000 to 1,000,000 gallons of brackish water from wells at the city's level and of good water from wells twelve miles away and 800 feet below the city's level. Which is preferable, distilling the first or pumping the second? Who can furnish distilling plants for such purposes?

J. L. S., Mexico.

The enormous head against which the fresh water must be pumped greatly increases the cost of pipe and of pumping machinery as well as

the cost of operation and of repairs. It might be found more economical to put in more than one pumping station, thus dividing the lift. The most economical method of solving the problem could only be determined on careful study of the local conditions, including, especially, cost of fuel and character of labor, in addition to the usual considerations. The De la Vergne Company, of New York, and the Frick Company, of Waynesboro, Pa., are manufacturers of refrigerating machinery, and can doubtless supply a distilling plant. The James Reilly Repair and Supply Company, of New York, furnish evaporating and distilling apparatus of smaller capacity than that mentioned.

WATER-WORKS PLANTS AND FILTRATION.

I desire some information on water-works plants, both the gravity system and the direct pumping system. Also concerning filtration plants, both mechanical and sand bed filters. If you have any valuable articles on these subjects, please advise me of the numbers in which they appear.

Wm. S. Mead, Manager,
Spencer Electric Light Co., Spencer, Ind.

Articles on these subjects in recent numbers of MUNICIPAL ENGINEERING are as follows: "Sewage Disposal and Water Purification," J. N. McClintoch, p. 199; also, information on pp. 213, 219, September, 1900, and p. 34, July, 1900. Articles on various methods of filtration will be found on pp. 56, 113, 267, 297, 333, volume XVIII, January–June, 1900. That on page 297 describes the Albany sand filtration plant. There are so many articles on the general subject of water-works, and upon details, that reference to the indexes in the June and December numbers is recommended. A list of books on water-works was given on page 213, last month. There is scarcely a number of the magazine which does not contain several valuable articles and items of information about the construction, repair, and operation of water-works.

SANITARY REQUIREMENTS IN SEWERS.

We are gradually extending our sewer system and many persons connecting propose to connect a down-spout from roof, directly with the sewer, to convey surplus water and assist in flushing. I think such connection, if not trapped, unsanitary, on account of the facility it affords for bad air passing from sewer to house. If trapped, it does but little good in the way of flushing, and traps will be fouled with trash from roof. Of course, it will give fine ventilation for sewers, but will it not be at the expense of the sanitation of dwellings?

Many insist on 6-inch house connections. As our laterals are nearly all 6-inch and 8-inch, I can not see any good reason for using such large pipes to connect houses.

Joseph A. Wilson, C. E.,
Lexington, Mo.

The size of pipe used in your laterals indicates that you have adopted the separate system or that the laterals of which you speak are exceedingly short. If the first is true, your trouble will be with overloading the sewers if indiscriminate roof-water connections are made. Sometimes one or two roof connections can be made at the upper end of laterals, when showers are not too infrequent and there are no other provisions for flushing. But the admission of roof-water from a larger number of houses requires an increase in size of sewer, which is readily computed for given local conditions. It will be an advantage to the sewer to have such roof-water connections untrapped. If all joints are as tight as they should and can be made, and inlets are so located that sewer air will not find its way into the house, the omission of trap will not be detrimental to the house.

All fixtures in the house should be thoroughly trapped, and the traps ventilated where there is any possibility of forcing them by pressure of air in the sewer. If there is a trap in the house connection between the house and the sewer, it does not protect against gases produced by decomposition taking place in the pipes of the house system, so that tight joints and good traps to fixtures are quite as necessary with the main trap as without it. Under some circumstances it is easier to force a trap by pressure of air in or into the trapped house system than in a system without the main trap.

If there is much roof area, a six-inch house connection may be necessary. The capacity of a 6-inch or 8-inch street main is soon reached, and the number of such roof connections can not usually be more than two to four. The house connection should not be larger than computation shows is necessary, a small flow in a pipe a size or two too large being rather more liable than one of the right size to stoppage from deposits, unless frequently flushed with enough water to fill the pipe.

[By A. D. Thompson, C. E., for MUNICIPAL ENGINEERING.]

STANDARD CONSTRUCTION OF BRICK PAVEMENTS.

During my recent visit in Europe, among other things, I spoke to several engineers about our brick pavements, and the success with which they are meeting in our country. I promised to send them the best information on the subject, so that they could appreciate our progress in this direction, and be clearly informed as to the character of the bricks and method of laying. As you have been following this question very closely, would you kindly let me know what specifications or printed matter would give the best information in a condensed form for our foreign colleagues? Thanking you for the favor, I am, truly yours, *Rudolph Hering,*
New York City.

Brick pavements have been constructed in the United States for a period of about twenty-five years, but the extensive use of this class of pavement has been confined to the last decade, during which time there has been developed the many details of manufacture and construction necessary to produce a smooth and durable pavement.

This limited period of general interest in brick paving and the constantly varying methods of manufacture and construction have prevented a complete discussion of the subject in books devoted to paving questions, but brief treatments may be found in "Highway Construction," by A. F. Byrne, and a "Text-Book on Roads and Pavements," by F. P. Spalding. The best information is to be found in articles published in the technical periodicals, and particularly in MUNICIPAL ENGINEERING, which has devoted a great deal of attention to brick paving. In volumes 9 and 10 of this magazine there is a complete detailed description of brick pavement construction in a series of articles entitled "Brick Paving from Start to Finish," by M. Nicholson, C. E. The articles explain each step fully, including the preparation of the plans and specifications, the preparation of the subgrade, the construction of the foundation, the qualities of the bricks with tests for same, the filling of interstices, and paving next to street railway tracks.

"Brick Manufacture and Brick Pavement," by F. A. Calkins, M. Am. Soc. C. E., and "The Manufacture and Use of Paving Brick," by Daniel W. Mead, M. Am. Soc. C. E., are two excellent articles dealing fully with phases of the subject indicated by their titles. The first of these, with the discussion, is contained in Volume 25,

Transactions of the American Society of Civil Engineers, and is paper No. 524. The article by Mr. Mead was prepared for the International Engineering Congress of the Columbian Exposition, 1893, and is contained in Volume 29, with the discussion in Volume 30 of the Transactions of the American Society of Civil Engineers. The paper is No. 628 and the discussion No. 673. A brief discussion of the question and an outline of construction methods is contained in an article by Wm. H. Maxwell, in "The Surveyor and Municipal and County Engineer" (London), Volume 14, page 832.

The accepted standard construction on city streets is a single course of small bricks or blocks, laid on edge, with a cement concrete foundation 6 inches in thickness, between which and the wearing surface is placed a cushion of sand from 1 to 2 inches in thickness. The interstices of the bricks are filled with sand, Portland cement grout, coal tar, asphalt mixture or some patent grout filler. In a locality where bricks are cheap and traffic comparatively light, there is frequently constructed a pavement consisting of two courses of brick on a foundation of sand or gravel, the bottom course of brick being of an inferior quality and laid flat. There has also been constructed on the residence streets of a few cities a single course of brick, on edge, on a gravel or sand foundation, while one or two instances are recorded where a single course of brick has been laid directly upon the ground, with only a cushion of sand to give an even surface. Such a method has been used on some of the residence streets of Cleveland. These departures from the stable construction first mentioned have been made to cheapen the cost, and have proved satisfactory only in a few instances where the conditions were exceptionally favorable.

The best bricks and blocks now manufactured are made from shale or fire clay. It has become the general practice to determine the quality of the material to be used by a series of tests, including those for abrasion, absorption and cross-breaking.

LEGAL DECISIONS RELATING TO MUNICIPAL MATTERS.

[By C. W. Tooke, A. M., LL. B., for MUNICIPAL ENGINEERING.]

CONTRACTS OF MUNICIPAL CORPORATIONS—ULTRA VIRES.

In the case of the City of Kansas City *v.* Wyandotte Gas Co., the Court of Appeals of Kansas (Northern Department), the attempt of the city to repudiate a debt due the gas company for services rendered was based upon the contentions that the contract with the company was *ultra vires* and that the city had no power to contract indebtedness for the cost of lighting in excess of the amount of revenue derived from the 2¼ mill levy authorized by the laws of 1895. The facts showed that the city had the power to make the contract, which was made prior to 1895, and that at all times the city had treated the contract as valid up to the commencement of the suit. The court held that the city was liable for the amount due, as it had accepted the benefits under the contract, and that the act of

1895 did not affect the validity of the contract which was made prior to its enactment. (See Pac. R. 317.)

CONTRACTS OF MUNICIPAL CORPORATIONS FOR SERVICE—LIMITATION OF INDEBTEDNESS.

The Court of Civil Appeals of Texas has passed upon the much-mooted question whether a contract for service extending over several years, payable in installments as the service is rendered, is within the purview of the constitutional limitation forbidding an indebtedness beyond a fixed percentage of the taxable property. (Dallas Electric Co. *v.* City of Dallas, 58 S. W. R. 153.) Upon this question the court takes the ground to which the greater weight of authority inclines, that if such service is to be paid for out of the current revenues no indebtedness exists until the service is rendered. The Supreme Court of the United States passed upon this question in the case of Walla Walla *v.* Walla Walla Water Co., 172 U. S. 19, in which decision the following distinctions are drawn: "There is a distinction between a debt and a contract for a future indebtedness to be incurred provided the contracting party perform the agreement out of which the debt may arise. There is also a distinction between the latter case and one in which an absolute debt is created at once, as by the issue of railroad bonds, or for the erection of a public improvement, though such debt be payable in the future in installments. In the one case the indebtedness is not created until the consideration has been furnished; in the other the debt is created at once, the time of payment being only postponed.

(See, also, City of Valparaiso *v.* Gardner, 97 Ind. 1; City of East St. Louis *v.* East St. Louis Gaslight and Coke Co., 98 Ill. 415; Grant *v.* City of Davenport, 36 Iowa 396. In the report of the case of Dawson *v.* Dawson Water-works Co., 32 S. E. R. 915, the opinion of the Supreme Court of Georgia is given and a list of the decisions pro and con in the several states.)

STREET RAILROADS—POWER OF CITY TO REGULATE.

That the power of regulation of municipal service corporations is a continuing power, and one in the exercise of which a city is given a large degree of freedom, provided that the regulation is reasonable, is a fundamental principle of the law of municipal corporations. Just what is the test of the reasonableness of such regulation, however, has never been reduced to a definite statement. Each case seems of necessity to be decided upon its individual merits, and each new adjudication throws some additional light on the question.

The supreme court of appeals of Virginia had this question under consideration at its June term in the case of the Washington Ry. Co. *v.* City Council of Alexandria. The city passed an ordinance for the paving of King street, the principal business highway of the town, and ordered the street railway company to substitute a grooved rail for tram girder rails so as to facilitate the paving of the street. The street measured only thirty-seven feet from curb to curb, and consequently a good part of the traffic is compelled to follow the tracks and rails of the company. While the jury, to which certain questions of fact were left, found that the rails used were of an improved pattern, and that the grooved rail was not nec-

MUNICIPAL TAX SECRETS REVEALED BY THE CENSUS.

	Population	Annual municipal appropriation	Per capita municipal exp	Annual expense street cleaning	Per capita street cleaning	Annual expenses on parks	Per capita parks	Annual police expense	Per capita police	Annual fire expense	Per capita fire
Chicago	1,698,575	$18,384,195	$10.80	$1,061,655	.62	$1,791,659	$1.50	$3,563,633	$2.00	$1,753,247	$1.00
Boston	560,892	22,432,538	40.00	330,000	.60	181,300	.32	1,712,000	3.00	1,196,000	2.00
Philadelphia	1,293,697	20,252,675	15.00	961,206	.70	594,140	.46	2,957,974	2.00	1,020,906	.78
St. Louis	575,238	7,520,280	13.00	115,500	.20	114,328	.19	1,628,559	2.80	738,684	1.25
Baltimore	508,957	7,379,052	14.60	379,435	.74	240,000	.47	916,792	1.80	484,100	.95
Buffalo	352,219	6,613,418	18.00	135,000	.38	294,961	.83	777,840	2.00	668,385	1.90
San Francisco	342,782	5,692,385	16.00	220,000	.64	245,000	.71	820,000	2.40	705,000	2.00
Pittsburg	321,616	6,969,494	21.00	340,000	1.05	183,000	.57	494,000	1.50	472,000	1.45
New Orleans	287,104	2,071,120	7.00	142,650	.50	43,596	.15	.....	....	300,404	1.00
Detroit	285,704	4,458,773	15.00	153,000	.50	173,502	.60	554,850	2.00	654,560	2.30
Milwaukee	285,315	2,655,927	9.00	83,000	.29	75,985	.27	330,000	1.10	420,000	1.40
Minneapolis	202,718	2,366,184	11.00	....	....	222,821	1.09	210,000	1.05	317,000	1.50
Indianapolis	169,164	1,131,150	6.00	80,000	.47	87,610	.51	158,253	.90	196,337	1.10
St. Paul	163,633	1,651,000	10.00	36,197	.22	60,000	.37	185,000	1.10	200,000	1.20
Louisville	204,731	2,013,193	9.00	92,000	.44	67,590	.33	273,000	1.30	225,600	1.05
Denver	133,800	860,000	6.00	28,000	.19	51,783	.38	136,000	1.05	150,000	1.20
Toledo	131,822	920,876	7.00	88,100	.67	93,025	.71	114,375	.85	128,750	.96
Kansas City	163,752	1,025,000	6.00	65,000	.40	135,000	.82	225,000	1.30	200,000	1.20
Omaha	102,555	972,441	9.00	21,448	.21	45,646	.44	88,684	.80	121,872	1.20

NOTE—Calculations are all approximate.

essary to the paving of the street, and had been laid with the approval and acquiescence of the city authorities, nevertheless, the lower court rendered a judgment in favor of the city. The upper court in affirming this judgment grounds its decision upon the fact that the reasonableness of the ordinance was for the court alone to decide, that the presumption was in favor of the propriety and validity of what the city had directed to be done, that the representations of the company and the findings of the jury were not sufficient to overcome this presumption. There can be no doubt that the city council had the authority to make the regulation imposed in this case, and that the exercise of that authority in a reasonable manner, as determined by the lower court, was properly sustained.

(See in this connection, Dillon on Municipal Corporations, sec. 327; City of Baltimore *v.* Baltimore Trust and Guarantee Co., 166 U. S. 673).

MUNICIPAL INDEBTEDNESS — CONTRACT FOR SEWER.

Another case of recent date, in which the court was called upon to pass upon the construction of the constitutional limitation, is the Addyston Pipe and Steel Co. *v.* City of Corry, decided by the supreme court of Pennsylvania July 11. In this case the contract called for the appropriation of money in the treasury and for assessments upon the property to be benefited. At the date of the contract, in 1891, the city of Corry was in debt in excess of the constitutional limit, and the validity of the contract is to be judged as of the time it was made. But there was nothing to show that the amount to be paid out of the general fund was not at that time in the city treasury, or payable and subsequently paid out of the general revenues. That item did not, therefore, increase the city's indebtedness in the prohibited sense. This decision is based upon the principle that the limitation does not apply in those cases in which the contract pertains to the ordinary expense of the city, and is, together with other like expenses, within the limits of its current revenues and such special taxes as it may legally and in good faith intend to levy therefor.

COMMENT ON CURRENT TOPICS.

Standard Methods of Construction and Tests of Materials for Brick Paving.

Engineers have during the last six or eight years devoted much time and work in endeavoring to determine the best methods for constructing brick pavements suitable to various conditions of traffic, together with a safe and certain method of determining the qualities of the bricks. In the same period manufacturers have spared no work or expense to improve their product and secure a satisfactory and durable paving material. The efforts of these two classes of men have caused a rapid improvement in the material used and the construction methods, until brick pavements are now recognized as among the best in use in American cities.

There is, however, a wide diverg-

ence of opinion as to the best methods of construction and the proper qualities of brick, together with the tests necessary to determine same, which has produced varying and often contradictory specification stipulations by different engineers.

The manufacturer, in supplying bricks to different localities, comes directly in contact with these variations, and realizes more than any other person the benefits to be derived from uniformity in requirements for materials and stable and uniform methods of construction as nearly as practicable.

At the last meeting of the National Brick Manufacturers' Association there was exhibited a lively interest in this subject, and a special committee was appointed to recommend proper methods for constructing brick pavements. It was further agreed to request the appointment of a similar committee from the American Society of Municipal Improvements to co-operate with this committee and formulate plans and specifications for such work. It is important to note that this association of city officials, at the meeting held the latter part of August, in Milwaukee, showed their interest in and appreciation of this work by directing the new president to appoint such a committee.

In the discussion prior to the adoption of the motion the question was thoroughly considered and the arguments presented that these societies, by approving standard specifications, might deprive engineers of legitimate work and also that the approval of standard methods of construction would work a hardship in localities where cheaper methods might answer the purpose.

Such objections can hardly be considered applicable when the ends sought are thoroughly understood. It is not within the province of any association to approve specifications for work sufficiently in detail to carry on the construction without revision by a competent engineer to suit the conditions under which they are to be applied. It is entirely proper, however, and within the scope of work covered by these associations, to approve general methods of construction and general requirements for materials known and accepted as giving the best results, leaving to the parties in charge the details of the work and the adaptation of the general plan to local conditions. There is no doubt but the brick paving interests have been materially injured and the adoption of such pavements retarded by cheap methods of construction and the use of inferior materials. If general methods of proper construction can be approved by the two organizations whose members are most interested in such work, good construction is thereby advanced and beneficial results are certain to accrue to the engineer, manufacturer and municipality.

Uniform Municipal Reports.

The American Society of Municipal Improvements and the Central States Water-

Works Association have appointed committees of conference on the subject of uniformity in municipal accounting and reports. Other societies interested in this matter will meet at various times during the coming year, and it is hoped that they will all take similar action. The A. S. M. I. being the first to appoint such a committee, and occupying in some degree the entire field of municipal activity, is perhaps the logical leader in the making of arrangements for a meeting of the conference committees, and this magazine suggests that all societies contemplating the discussion of any phase of this subject appoint such committees and report their action, with the names and addresses of committee members, to the secretary of the A. S. M. I., Mr. D. L. Fulton, Allegheny, Pa., that there may be as little delay and confusion as possible in taking the preliminary steps. The movement is a most important one, and the time is at hand for some definite formulation of what seem to be the best of the many propositions now under discussion.

A Method of Cleaning a Filter. In the discussion on filtration of water at the recent London meeting of the American Society of Civil Engineers, Mr. E. Perrett, Assoc. M. Inst. C. E., presented a bit of English practice which may be of interest. The filters for a population of 30,000 (consumption not stated) are eighteen tanks, each 5 feet square. In a space left between the bottom plate of the tank and a wire framework supporting the coarse charcoal used as a filtering material, a branching perforated pipe is located. When the filter is to be cleaned the discharge pipe is closed, a dirty water waste pipe is opened, and air under about six pounds pressure is forced through the perforated pipe, passing up through the filtering material, disturbing it and washing away the dirt. The water to be filtered is often very dirty but is not sewage-contaminated. The rate of filtration was about 120 gallons per square foot of area of filter per hour, and the cleaning took 7 or 8 minutes once in 10 or 12 hours.

This process prevents the waste of clean filtered water for washing the filter, as in the ordinary mechanical filter. It is doubtless true, however, that the results as to removal of bacteria are not comparable in this filter with the results in the American mechanical filter. No bacterial surface layer is cultivated or expected and none can be formed under the system of frequent cleanings. The results for clearness of water are said to be satisfactory and the rate of filtration is certainly large, but the application of the system to a sewage-contaminated water would probably not be advisable.

Multiplicity of Municipal Associations. It is beginning to appear that there are too many societies devoting themselves to the discussion of methods of municipal government and of con-

structing and operating municipal public works. The development of a condition which has resulted in so many societies is one of the most hopeful signs of the times. It is an indication that municipal officials are becoming interested in their duties sufficiently to wish to study the methods of others in comparison with their own; that municipal employes are trying to improve the character of the work in their departments by increasing their own knowledge through the interchange of experiences; and that the number of private citizens who are interested in good local government has increased enough to make it possible to sustain an organization for the discussion of the underlying principles.

The reason for so many societies is doubtless to be found in the fact that this interest has developed almost simultaneously in the three classes mentioned, and that different groups of individuals have developed special interest in different special questions, so that societies were started at the same time to discuss practically the same questions from different standpoints. Others, desiring to consider different groups of problems, have started still other societies, none of those existing seeming to cover the ground desired. A few meetings have shown the essential unity of design in the various societies, and the unattached individual is often at a loss which to join.

The time seems to have come for an attempt at unifying the organization of the societies to correspond with their unity in design. A federation of the various societies to bring the times and places of holding conventions together would be most advantageous for all the societies concerned. Membership in any of the various societies could carry membership in the federation, and the advantages of attendance at meetings of other societies where subjects of individual interest were under discussion. Details of eligibility for membership, election of members of particular societies, of officers, etc., need not be modified, but membership in any one of the federated societies should carry the right to attend the general meetings of any other society, and to receive a copy of the printed proceedings of all the societies in the federation if desired. It might be desirable to have a general membership of the convention or federation for such as did not join any particular society, giving rights of attendance at meetings, and to a copy of proceedings, but no rights as member of any individual society. It would probably be advisable to have the proceedings published by the federation, the expense to be paid by such general membership fees, and by assessments upon the federated societies in some equitable proportion.

Officers of the federation could be elected at a joint meeting of certain prescribed officers of the federated societies.

There will be many advantages

in this common time and place of meeting besides those mentioned, and the reduction in transportation charges to be secured by the larger conventions thus made possible.

The American Society of Municipal Improvements has made the first step in this direction by asking the National Municipal League to meet at Niagara Falls next year at a time to be agreed upon. Other societies are informally invited to join in the movement at the time and place agreed upon.

Improvement of Municipal Methods.

A recent occurrence in a western city shows the inefficiency of the methods of accounting in vogue and demonstrates that some of the city officials were either incompetent or dishonest. It was accidentally discovered some six months ago that a payment was entered $1,000 less than the actual disbursement. In the meantime an election has occurred and the outgoing officer has transferred his books and cash to his successor. Unless the official in question receives his compensation in fees and the office is a gold mine, it is hardly possible that he could turn over so much more than was due from him without a murmur unless enough errors in his favor had occurred so that he would not miss this amount from his salary. It is such methods of accounting as this which give the opportunity to dishonest persons to operate upon the city's strong box, and the lack of inspection enables them to work without detection. Occasionally an honest man is the victim of this lack of system and leaves the office poorer than he went in, his lack of business training making him powerless to search out the errors. Such a man has been known to be the victim of his dishonest subordinates. The question of the ownership of fees is a frequent cause of dispute, the average public official usually assuming that, in case of doubt, they belong to him. That the public is practically in sympathy with this attitude and is willing to give the official the benefit of every possible doubt is shown by a recent election to a prominent city office of a man under indictment for misappropriation of funds as a county official, his defense being a rather flimsy claim that the fees so appropriated by him were not the property of the county but of himself.

So many persons, who have had experience in or opportunity to observe the methods of accounting in operation in city offices, report similar occurrences and ample opportunity for more as yet undiscovered, that it is perfectly safe to say that, in our smaller cities, and to some extent in the larger ones, full competence and strict honesty combined in the same office-holder are not very frequent.

Let each one weigh the public spirit, the competence, the power for good of the officials in his own city from year to year and determine for himself whether the combination of the three in any one person is a frequent occurrence.

A very few are able to do more than follow the methods of management and accounting in vogue in the office, without reference to whether they are sufficient, and it is seldom, indeed, that one has the power to co-ordinate the methods of different offices with more or less connection, so that efficient systems of checks on expenditures and on accuracy of accounts are established.

The ordinary official gets a compliment when he leaves his office, because he has been obliging to those with whom he has come in contact, and without reference to the accuracy of his work, because there is seldom any check upon it. A few more are public-spirited and will sacrifice their personal desires and convenience for the benefit of the city; but a clear majority agree with that large proportion of their constituents who declare that "to the victors belong the spoils," and, while perfectly honest in their personal dealings, will do or permit transactions in their official capacities which, strictly speaking, can only be termed dishonest. The appointment of supernumerary or incompetent employes is perhaps the least of these. We are all so accustomed to these things that most of us are righteously indignant if such actions are called by their proper names, and we can not recognize them by such names. The men with power to exert their public spirit in the performance of their duties can be counted quickly. Such a combination of competence, public spirit, power and honesty as was found in Col. Waring when he found his proper field, is exceedingly infrequent in our large cities. Less ability or less force, but equal public spirit and honesty, are necessary in smaller cities, but proportionately they are not found any more frequently.

Unquestionably the low standard set for city officials is set by the citizens and they are responsible for the results. Under the American system the office-holders can not average any better than the community. The honest, competent man with public spirit and power can be found in politics frequently, but he seldom takes city office. He is usually in too great demand elsewhere to enter the class of office-holders, or to stay there long if he does accept election. The competent man whose honesty is not so spotless as Cæsar's wife, though considered sufficient for ordinary purposes, is far more frequent in politics, and the city official is too often his mere tool.

These statements voice the opinions of practically all those of varied experience in the field and are the reason for the increasing agitation of the questions arising as to what can be done to improve our governmental machinery, that it may be an educator and an elevator of public sentiment instead of being a drag upon progress, as is now too often the case.

Water Waste Prevention. Mr. J. J. R. Croes has been making an investigation of the consumption of water in twenty-five houses in New York

city similar to that made by Mr. Trautwine in Philadephia some months ago and reported in these columns. His conclusions are practically the same, the legitimate use of water proving to be about 50 per cent. of the actual delivery. In eighteen of the houses the average consumption was 50.84 gallons per capita, and the waste in the other seven houses was enough to increase the rate for the twenty-five houses to 91.36 gallons per capita. The source of the waste in every case but one was defective fixtures or undiscovered leaks, many of them unknown to the occupants. In one case the closets and the urinals in a saloon were treated to a continual stream of water consuming 4,522 gallons a day. Attention to the leaks saved about 5,000 gallons a day in the seven houses and reduced the average consumption in the twenty-five houses to 65.55 gallons per capita per day, a saving of 25.81 gallons per capita without any reduction in the actual use of water.

The value of meters in detecting the waste and preventing its future occurrence is evident. The economy of installing meters that the waste may be paid for if it is allowed to continue is easily determined.

Tar-Macadam. The tar-macadam pavement constructed in Hamilton, Ontario, some years ago, has met with sufficient success to lead the city of Toronto to test its value under the conditions of traffic there. Nearly a thousand linear feet is under construction at a cost of $1.50 a square yard, with wooden curb. The pavement consists of 4 inches of large broken stone washed full of sharp sand; a second layer of 4 inches of 1½-inch dried stone, mixed with coal tar in the proportion of 12 imperial gallons of tar to a cubic yard of stone, the layer being rolled with a 9-ton roller; a third layer of ¾-inch stone, ¾ inch thick, mixed with fine gravel and the same proportion of coal tar, and thoroughly rolled; a fourth thin scattering of dry fine gravel and coarse sand. The new construction takes the place of an old wooden pavement. Its comparative value will be of interest, for a macadam street has many advantages over a cheap wooden block street, and if the disadvantages of the macadam for city streets are overcome to a reasonable extent by the admixture of tar, the new form of pavement may find a large field for application.

Tensile Strength of Cement. The periodic questioning of the value of tests of tensile strength of cement has again arisen. The ease of making the tests, the comparative uniformity of results attainable, all things considered, the simplicity and relatively light cost of the apparatus necessary, are hard to overcome by any theoretical considerations indicating that other methods, such as crushing and cross-breaking, may be better, especially since there are strong theoretical arguments in fa-

vor of continuing these tests as the main reliance in testing an approved brand of cement. The committee of the Am. Soc. C. E. has gone more into detail with these tests than with any others, and in general has more replies in better accord. Most answers are favorable to tests of Portland cement mortar in proportions of 1 to 3, and of natural cement mortar in proportions of 1 to 2. Many are in favor of neat tests only, at least one presenting an argument to show that mortar tests are little more than tests of fineness of grinding and relative value of different samples of sand. Twenty-five out of 29 adhere to the society's standard form of briquette. Most of them do this on account of satisfactory experience with this form, but seven have made comparative tests with other forms.

A non-absorbent smooth surface is demanded for mixing cement, marble, slate, glass, or smooth metal. Over half finish with trowel on upper side only, but the remainder give very good reasons for compressing the briquette with trowel or knife on both sides. Some fix the consistency of mortar by fixing the percentage of water to be added, nearly all using as little water as possible. One-fourth of the replies prefer machine molding of briquettes, the other three-fourths preferring hand-work, some ramming the cement into the mold and others claiming uniform results from pressing the cement in with fingers or trowel. Only four of those recommending mixing by machine have used the machine they recommend.

A majority leave the cement in the molds until set, then take out and cover with a damp cloth, or place in damp air for 24 hours before placing in water. One or two call attention to the desirability of testing briquettes immediately after removal from water. As to renewal of water, temperature and uniformity of temperature, there are many opinions. The largest number of votes is for constant temperature, and for renewal of the water from time to time, varying from running water to once a week.

For acceptance tests on ordinary work the general opinion favors breaking briquettes at end of twenty-four hours for natural and of seven days for Portland cement. Longer time tests should be made if the short-time tests are unsatisfactory for any reason and more information is desired. A few consider that weighing briquettes before testing gives data as to density, which may be of value in giving the reasons for discordant results. More are of the opinion that the test is of no value. Experience ought to show which is nearest the truth, and the explanation of a few anomalous results by variation in density would seem to demonstrate the value of the test. Most replies favor the Fairbanks or Riéhlé form of clip, with rubber bearings, as being more certain to

cause breaks at the smallest section of the briquette, and not at the clip, the latter occurring when there is a crushing under the bearing of the clip, a bending or a twisting of the sample. There is little interest or uniformity in the distance between opposite gripping points of the same clip, some apparently misunderstanding the question. Uniform rate of application of 400 pounds of stress a minute is recommended. With strong cements, the rate at first may be more rapid, but the latter half or fourth must be applied slowly at a uniform rate. Sixteen votes are for the Fairbanks, three for the Riehlé, three for either, one for the Olson, two for the Michaelis, and one presents a design for a machine.

The suggested improvements in machines are in clip bearings which seems to be the point of most trouble. A number of miscellaneous suggestions of little value were presented to the committee. The special precautions to be taken are in adjusting the clips, in avoiding the sudden application of stress and in breaking briquettes immediately after removal from the water.

Some of these questions have enough definite answers to be of value to the committee, but there are quite a large number which indicate lack of close study of the principle involved, and the committee will do well to ignore the conclusions drawn while taking full account of the actual facts of experience in such cases.

THE CONSTRUCTION OF STANDARD MEDINA STONE BLOCK PAVEMENTS.*

By E. A. Fisher, M. Am. Soc. C. E., City Engineer, Rochester, N. Y.

The first requisite of a good pavement of any kind is a proper sub-grade. As a preliminary to the preparation of the sub-grade, all underground construction required should be done. This work, except in the case of outlet sewers, where the assessment territory varies from the territory assessed for the pavement, should be done under the same contract as the pavement.

Private corporations or individuals should not be allowed to excavate and refill trenches in a street under contract except with the consent of the paving contractor, and under his inspection, as well as that of the city. In this way only will it be possible to concentrate responsibility and get satisfactory work.

The most serious settlements, and in fact nearly all the settlements occurring in our newly paved streets, are over sewer trenches where the work has been done from two to ten years; the original backfilling not having been properly done.

In the case of a large sewer built under a separate ordinance immediately in advance of a new pavement, the contractor for the pavement guarantees the entire pavement against settlement, but for such portion of the repairs as may be caused by a settlement of the backfilling of the sewer trench he receives a fixed price per square yard, which is deducted from the reserve of the sewer contractor. The special notice in the sewer contracts in such cases reads as follows:

"The contractor is hereby notified that an ordinance for asphalt and Medina block stone pavement in blank street has been duly adopted, and that said pavement will be laid during the summer of * * * To insure the proper performance of the backfilling of trenches excavated under this contract, the contractor will be held responsible to the extent and in the manner specified below for all settlements which may occur anywhere in the line of his work for

*Read before the American Society of Municipal Improvements at the annual meeting in Milwaukee in August, 1900.

It will be understood that references to methods of construction refer to the present practice in the city of Rochester, N. Y., unless otherwise stated.

a period of three years. It is therefore understood and agreed that said board may retain for three years from the completion of this work the sum of 20 per cent. of the gross amount of the final estimate for this work, and that said board may expend the whole or such part thereof as may be necessary to pay for taking up and relaying both concrete foundation and asphalt or stone surface, where said pavement may settle over any trench backfilled under this agreement. The amount to be deducted by said board as aforesaid for taking up and relaying said pavement and refilling said trenches is hereby fixed at the sum of $— per square yard."

The underground work referred to, consisting of local sewers, lateral sewers, surface sewers, water services, gas pipes and services, electric conduits, and any other

E. A. FISHER,

City Engineer, Rochester, N. Y.

excavation, having been completed, the curb are generally next set in place.

Curb stones are of Medina sandstone in lengths of not less than three feet; usually from four to six feet. The thickness is usually six inches and the depth eighteen inches. The inside top corner is cut to a radius of one and one-fourth inches. The top and arris are axed to a smooth surface, and the face point dressed to a plane surface having no projections or depressions exceeding one-fourth inch.

The curb is set in a bed of concrete six inches thick and twelve inches wide, connected with the concrete foundation and the street paving in front, and extending twelve inches in hight on the back, and four inches thick. Under the concrete is a three-inch farm tile laid in coarse gravel connected with the surface sewer.

The final excavation for the sub-grade is then completed and then rolled with a heavy steam roller, or stamped in places inaccessible to the roller. All depressions in the surface found after rolling are filled with proper material, and stamped or rolled, and the sub-surface is then ready for the concrete foundation. The thickness of this foundation is not less than six inches. In streets of heavy traffic, especially if much excavation has been done in the street, Portland cement concrete should be used. Ordinarily, natural cement concrete is used. The specifications for concrete conform to the generally accepted standard, and will not be repeated here.

In case the street is occupied by a street railway, the present practice is to serve a notice upon the railway company to pave that portion between the tracks and for two feet outside thereof, pursuant to the provisions of the general street railway act of the state of New York. The railway company neglects to do this paving, and an ordinance is then adopted covering said work and directing that the cost be charged to the railway company.

The method of construction adopted has been described at previous meetings of this society and in the engineering and municipal journals, and will only be briefly referred to here. The methods of construction have been adopted.

First.—Wooden Tie Construction.—The ties are spaced two feet from center to center and bedded in concrete, the depth under the ties being five inches, and the total depth in the space occuped by the tracks, twelve inches. The rails in both methods of construction are 9-inch girder rails, full grooved. The surface of the concrete is left eight inches below the finished grade. The rails are thus supported between the ties on a solid floor of concrete twelve inches thick. The concrete generally used is made of natural cement.

The second method consists in the use of concrete beams of Portland cement twelve inches in depth under each rail, and connecting with the foundation of the pavement between the rails six inches thick put in at the same time, of the same materials, the width of the 12-inch beam portion being for the center rails fourteen inches, and for the outside, sixteen inches. The rails are held in place by iron ties, generally made of old street car rails, spaced six feet center to center, bedded in concrete. A 3-inch farm tile drain is laid under the foundation connected with surface sewers, in both methods of construction.

The concrete foundation having been prepared, the curbs set, and all permanent fixtures in the street, such as street rail-

way tracks, manhole heads for sewers and conduits, surface sewer inlets, etc., having been adjusted to the proper grade and crown of the finished street, the sand cushion for the paving blocks should next be spread upon the foundation. The sand should be moderately fine, clean, sharp and dry. The normal thickness should be about two inches.

Much of the success of the pavement depends in keeping this sand cushion of as nearly a uniform thickness as possible. In the case of a brick pavement I believe the thickness should be uniformly one inch. In the case of Medina stone somewhat more lattitude must be allowed. We specify the depth of stone from six to six and one-half inches. We make the surface of the concrete eight inches below the finished grade; the maximum cushion then is two inches and the minimum one and one-half inches. I believe this is a proper allowance. In the case, however, of Medina block stone, laid outside the street railway tracks and connecting with asphalt, the stone blocks should be bedded in Portland cement mortar instead of on a sand cushion. I am of the opinion that such a construction carried over the entire street would result in a much more satisfactory pavement, except in cost, than a pavement on a sand cushion.

The Medina sandstone, from which the paving blocks in question are obtained, crops out along the line of the Erie canal between Rochester and Lockport, N. Y. The nearest quarries are at Hulburton, about thirty miles westerly of Rochester. Numerous quarries line the Erie canal on either side for about twenty miles. The stone varies somewhat in color and texture in the different quarries; it is generally of a red or pink color. The crushing strength of specimens of this stone from the town of Medina is given by Gen. Gilmore at 17,500 pounds per square inch on bed, and 14,812 pounds per square inch on edge. Specimens from Albion gave 13,500 pounds per square inch on bed, and 11,250 pounds per square inch on edge. The crushing strength of other varieties of stone by the same author is given for comparison:

	lbs. per square inch.
Middletown, Conn., brown stone	8,000
Haverstraw, N. Y.	4,300
Cleveland, O.	7,250 to 10,250
Other prominent sandstones	4,250 to 8,000
Limestones, Erie county, New York	12,250
Other limestones	6,650 to 25,000
Granites, Keene, N. H.	10,375 to 12,875
Other granites	13,000 to 22,000

It will thus be seen that this stone compares favorably even with granites, in crushing strength. The weight, per cubic foot, is about 150 pounds. The stone is fine grained, but does not polish and become slippery with use.

The specified size of paving blocks is as follows:

Depth	6 to 6½ inches
Thickness	3 to 5 inches
Length	7 to 12 inches

The specifications also provide that the stones shall have close joints for at least 3½ inches from the top down; the top surface to have no projections exceeding ¼ inch.

The blocks should be carefully culled by the contractor before being brought on the line of work. This, however, is not generally done, and consequently much extra work is required on the street.

The stone blocks are laid in straight courses of even width at right angles with the line of the street, except at street intersections. At the intersections of streets crossing at right angles the blocks are laid on an angle of 45 degrees, meeting in the center, so that the traffic coming from the intersecting street will come as nearly as possible at right angles to the courses of stone. The joints should be broken by a lap of at least three inches. After the blocks are laid they are lined up and gone over by the pounders. Then hot gravel is swept into the joints and the pavement again thoroughly rammed with wooden rammers weighing about seventy-five pounds each. The joints are then nearly filled with hot gravel poured from tin cans and then raked out to a depth of from two to three inches. The paving pitch is immediately poured into the joints while the gravel is still hot and allowed to settle and the joint refilled until flush with the surface. Then more hot gravel is sprinkled over the surface and left to work into the paving pitch. Owing to the close joints the gravel used must be fine. The specified size is that it must pass through a sieve having four meshes per square inch and be retained on a sieve having eighty-one meshes per square inch. Gravel filling the above requirement is found within a reasonable distance from the work.

The paving pitch used is what is known as "No. 4 paving composition."

Measurements taken on the completed pavement of three different streets give the following widths of joints: In a street now being paved, fourteen courses measure five feet five and one-half inches in width, including joints. The average width of the stone blocks is 4.39 inches, and the average width of joint five-sixteenth inch. In a section of street paved last year the average width of blocks was 4.54 inches, and the width of joints five-sixteenth inch. In a section of Main-st., paved in 1894, the average width of blocks on top was 5.25 inches, and the average width of joint nine-six-

tenths inch. This street carries a very heavy traffic, and has been paved for six years.

The amount of pitch used per square yard of pavement, in sections of four streets improved this season, is as follows:

Street No. 1—Average 1.47 gallons per square yard.
Street No. 2—Average 1.33 gallons per square yard.
Street No. 3—Average 1.38 gallons per square yard.
Street No. 4—Average 1.35 gallons per square yard.
Average of the four—1.38 gallons per square yard.

On a few streets a grout composed of one part Portland cement and one part of fine, sharp sand, has been used. This grouting gives a very satisfactory pavement when the street can be closed for a sufficient time to allow the cement to thoroughly set. As the joint filler is one of the essential parts of a good block stone pavement, it is hoped that as much interest will be developed in this discussion as was given to the subject in the case of brick pavements in our meeting last year.

The crown of a 30-foot roadway is generally 5 inches; 40 feet, 6 inches; 50 feet, 7 inches; and generally the center is in inches above the gutter 1-6 of the width between curbs in feet.

In the case of a street having railway tracks, the inside rail is ⅛ inch above the outside, and the center of the street ½ inch above the inside rail.

The corners are cut off generally to a radius of 13 feet. This radius is modified to suit existing conditions. The crosswalks are usually 4 inches below the curb and surface sewer inlets are placed on the upper side. The depth of gutters is generally 6 inches. The minimum grade is 4 inches per 100 feet, and when this cannot be obtained, the depth of gutter is varied from 5 to 7 inches between surface sewers so as to secure this result.

Crosswalks consist of from three to five courses of Medina stone 18 inches wide and 6 inches in depth, spaced 6 inches apart, the space being filled with block stone. The joints are cut on a bevel of 4 inches, the bevel so placed as to bring the joints as near as possible at right angles to the line of traffic from intersecting streets.

The first Medina block stone pavements on a concrete foundation were laid in Rochester in 1893. The cost of the pavement, complete, including grading and concrete foundation for the main streets, was from $3.09 to $3.29 per square yard. The main business portion of Main street was laid in 1894 and cost $3.32 per square yard. The present prices are from $2.60 to $2.75 per square yard. The block stone costs at the quarries about $1.25 per square yard.

The total length of block stone, laid on concrete in the city, on January 1, 1900, was 6.51 miles, or 151,772 square yards; one-half of which was laid in the year 1899.

The city of Buffalo had, on January 1, 1899, 4.815 miles, or 885,722 square yards, costing on an average $2.92 per square yard. The first block stone on concrete laid in Buffalo, in any amount, was in 1892. There were, however, 103.76 miles, or over 2,000,000 square yards, of common Medina stone, on sand foundation, laid in Buffalo on January 1, 1899. Medina block stone pavements were first laid in Cleveland, Ohio. I was recently shown a Medina block stone pavement on one of the main streets over 20 years old. This pavement was laid on the natural ground of the street, the joints filled with pitch. The pavement is in good condition, the blocks are worn smooth on top and not rounded as is usually the case in the granite.

Rochester has laid common Medina stone pavements for about fifty years. We had on January 1, 1900, nine streets of an aggregate length of about one mile, laid previously to 1857. It is unnecessary to say that they are not now in first-class condition.

There are no statistics available as to the life of Medina block stone on a concrete base, or as to the cost of maintenance. Any available statistics relating to the cost of maintaining common Medina stone on sand are misleading, and of no value. Many of the pavements have not been maintained in a condition fit for travel. In the business streets the pavements have been ruined by the numerous excavations for pipes and conduits of various sorts, and are left in an almost unbearable condition for years.

On Main-st. this pavement has supported probably as heavy traffic as passes over any street, outside of New York and Chicago, for six years. The joints are still in good condition. The stones have worn flat on top, but are not polished or slippery. I have been unable to measure the wear of the stone. The first repairs on this street were made this year and cost about $200 for about 12,000 square yards of pavement. Observations of the travel were made on Oct. 26, 1897, and again on Aug. 23, 1900. The estimated daily traffic, based on the latter observations, is 1,250 loaded vehicles, 1,200 empty, 1,274 carriages, the estimated weight of which is 7,500 tons per day. In addition an average of three street cars per minute pass over this portion of the street during the business part of the day on two tracks. The width between curbs is sixty feet.

PRESENT PROBLEMS IN MUNICIPAL ENGINEERING.*

One of the chief difficulties municipal engineers have to contend with is that arising from the pollution of rivers and streams by sewage and manufacturers' trade refuse. How to prevent or at least minimize the effects of such pollution at reasonable cost is a problem yet to be solved. This question has been before municipal authorities in a more or less acute stage for upward of thirty years, and during every decade within that period they have been many times assured by enthusiastic and zealous persons as well as by interested individuals in search of gain only, that a solution has been found and a road to complete success made easy. It would serve no good purpose and would occupy too much time to merely enumerate the heads of the many patent inventions and other processes that have been brought before the public with this object. I will refer very briefly to some of the efforts that have been made during recent years in the north of England to restore the rivers and streams to something approaching their original condition.

In no part of England is there a better field for the operations of the municipal engineer and chemist than in portions of Lancashire and Yorkshire, where many of the rivers and streams have long since been deprived of their natural degree of purity and were in some cases until quite recently little better than open sewers. These rivers were the conduits for the removal of the crude sewage of a vast population. They were also freely utilized as scavengers for conducting away enormous quantities of refuse matter resulting from the great industries for which those counties are so justly celebrated. The rivers were employed not only for the removal of waste matters of every kind, but also in some instances, their waters from the source downward were used and reused many times over for trade purposes. Manufactories were erected beside, and, indeed, occasionally over, the rivers with the object of readily abstracting and utilizing the water which was impounded by weirs placed across the rivers. In addition to all this pollution it was the general practice to tip waste solid matter into the rivers or to deposit it in convenient positions on the banks so that it might be washed away in times of flood.

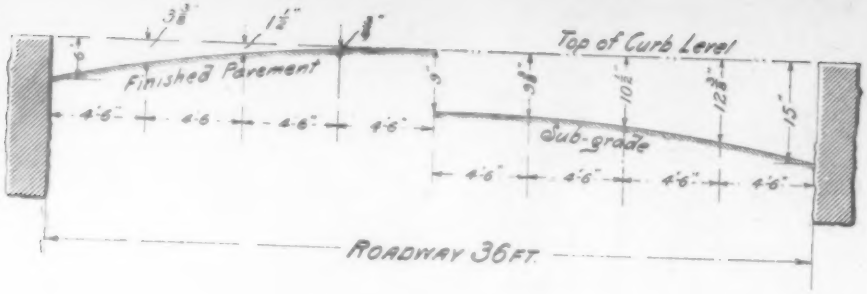
The task of purifying the rivers under such conditions is one of great difficulty and involves a large capital outlay and a big annual expenditure, and even then purification can, of course, be effected in degree only. No thoughtful person who has considered the subject can suppose that it is practicable by any artificial means or by regulations, however well applied or skillfully administered, to restore the rivers to a condition of purity at all approaching their natural state while their waters are utilized for manufacturing purposes and receive the liquids resulting from the sewage of the towns within the watershed.

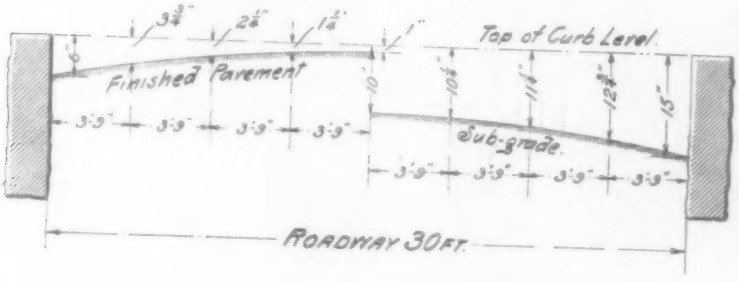
The state of things above described continued in Lancashire and Yorkshire until after the passing of the local government (England and Wales) act, 1888. Under the provisions of that Act (section 14, subsection 3), joint committees were formed in the counties of Lancashire, Chesire and Yorkshire. The Mersey and Irwell Joint Committee control the district included within the watersheds of the rivers Mersey and Irwell above Warrington. The Ribble Joint Committee deal with the watershed of the Ribble. In Yorkshire the West Riding Committee exercise jurisdiction over the rivers in the West Riding of that county. I propose today to confine my remarks to the district of the first mentioned authority.

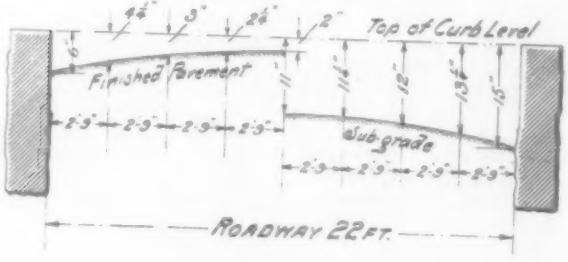
The Mersey and Irwell Joint Committee have the control of an area of 482,195 acres, with a population of upward of 2¼ millions, and a ratable value of over 10 millions sterling. It includes the rivers Mersey, Irwell, Medlock, Irk, and Roach, all of which discharge their waters into the Manchester Ship Canal. Within this area there are between 400 and 500 manufactories. The industries carried on are various, and comprise calico printing, dyeing and bleaching, paper-making and staining, tanning, leather dressing, woollen and silk manufacture, chemical and soap works, brewing, fellmongering, etc. No record of the quantity of manufacturers' refuse passed into the rivers which feed the Ship Canal is available. In some instances either under special arrangements or otherwise, the manufacturers have obtained the privilege of discharging the liquid refuse of their works into the sewerage systems of the towns, and in such cases it is treated by the local authorities.

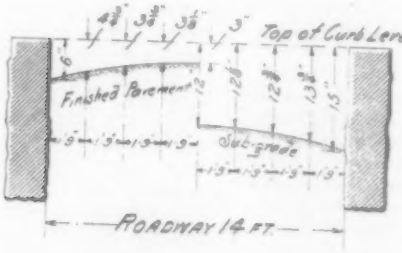
Many of the manufacturers whose works are situated in populous neighborhoods have but little land upon which to lay down plants for purification purposes, and as the law requires them to adopt the best practicable or reasonably available means of preventing pollution, it is desirable that, where circumstances will admit, they be permitted to discharge their refuse effluent into a sewerage system, in order that it may be properly dealt with by the sanitary authority, who should, however, have complete control over its admission to the sew-

*From an address before the Paris Convention of The Sanitary Institute, by Mr. Thomas De Courcy Meade, M. Inst. C. E., the Presiding Officer.

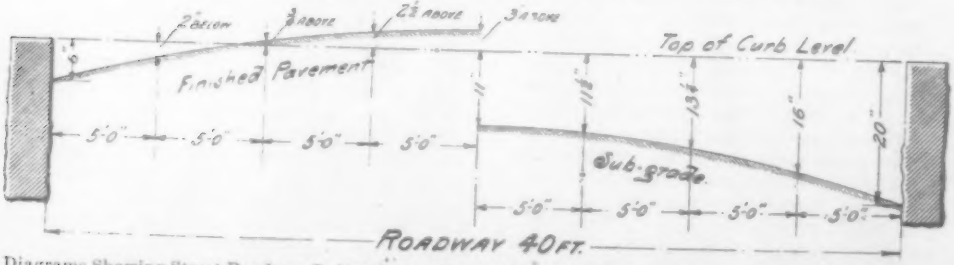








for TELFORD-MACADAM PAVEMENTS.



Diagrams Showing Street Roadway Ordinates for Sheet Asphalt Pavements. By Bureau of Engineering and Construction, Pittsburg, Pa.; Geo. W. Wilson, Director, and John Brunner, Superintendent.

ers. The pickle from galvanizing works, for instance, might with advantage be permitted to enter the sewers in some cases if admitted in a relatively small and regular volume, and this would under certain conditions effect a saving in the chemical treatment at the outfall. If, however, it were discharged at irregular periods in large quantities, it might seriously interfere with the general treatment of the sewage. It is important that no waste matter which would injuriously affect the structure of the sewers or would throw down heavy deposits therein, be admitted until it has undergone sufficient treatment by the manufacturer, and the plant used for this purpose should be open to official inspection at any time of the day or night without notice. Manufacturers' refuse containing chemicals liable to generate explosive or other dangerous gases in the sewers, either separately or in combination with other chemicals, should be rigidly excluded.

Many of the manufacturers no doubt benefit by the recent improvements in the condition of the water in the rivers. I am informed that the difficulties found in purifying trade refuse have led to a more careful examination of the waste matters and that a saving has in some industries been effected by utilizing matters that were previously allowed to pass away as worthless.

Manufactories placed in open situations where land is available have better opportunities of dealing with the waste liquids, and many large works so situated in Lancashire have expended considerable sums of money in purification plant and appliances. The methods generally adopted are precipitation followed by mechanical filtration. The coloring matter contained in the liquids passing from large dye-works into the rivers gave the latter the appearance of pollution, far in excess of what is actually taking place.

The approximate quantity of sewage effluent from towns which passes into the rivers within the Mersey and Irwell watersheds amounts to a normal flow of something like 68,000,000 gallons per twenty-four hours. Most of this sewage now undergoes treatment before admission into the rivers, and it represents about 52 per cent. of their minimum dry weather flow.

The condition of the rivers within these watersheds has undoubtedly improved within the last few years, although statements have been publicly made to the contrary. The limit of impurity allowed in sewage effluent when passed into rivers, or in other words, the standard of purity required by the joint committee is "one grain per gallon oxygen absorbed in four hours, albuminoid ammonia, 0.1 grain per gallon." The laboratory tests applied are, for ammonia (free and saline) and albuminoids, oxygen absorbed three minutes and four hours test, and for chlorine. The published official tests of "bad" effluents do not give the amount of solids in suspension.

A series of experiments, extending over a considerable period, was conducted by Sir Henry Roscoe at the Manchester Corporation sewage works, with the primary object of ascertaining the quantity of solids removed from the tank effluent by mechanical filtration. The quantity of dry solid matter removed was found to vary from 19½ to 57 pounds per 100,000 imperial gallons of tank effluent filtered. The quantity of solids removed varied also, as the following two analyses will show:

Analyses of Sludge Dried at 100 Degrees, from the Wilson Filter.

	No. 1.	No. 2.
Organic matter	38.0	45.8
Silica and gangue	12.9	7.3
Oxide of iron and aluminia	35.5	23.2
Calcium carbonate	13.6	23.7
	100.0	100.0

From the above figures it will be seen that the tank effluent contained from 1.36 grains to 4 grains of suspended solids per imperial gallon, the ratio of organic matter to inorganic matter being in the proportion of about 2 to 3.

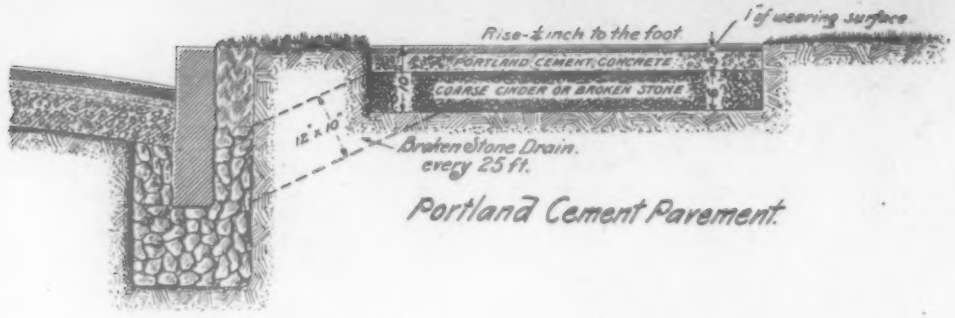
It has been a matter of remark that the quantity of solids now annually intercepted and removed from the sewage and from the manufacturers' refuse before discharge into the rivers has not made much reduction in the Ship Canal dredging. The material now dredged from the non-tidal portion of the Canal is largely composed of matter erroded from the river banks by the action of water, together with that washed into the rivers from the surface of the ground in flood-time; this material will, of course, continue to be washed into the Canal. In some of the towns, however, the river banks are protected with walls, and portions of the river beds are paved or inverted, with good result.

The estimated quantity of sludge now annually removed from the sewage of the towns is about 620,000 cubic yards as against 638,877 cubic yards removed from the non-tidal waters of the ship canal last year.

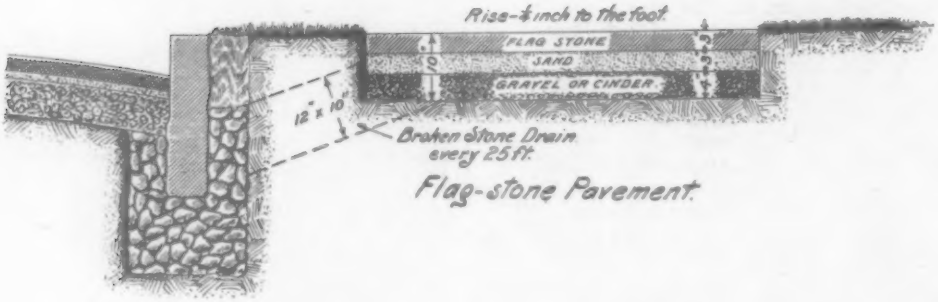
The following statement gives the actual quantities in cubic yards of sludge and silt dredged from the Canal during the last three years:

Year.	Eastham to Latchford.	Latchford. to Irlam.	Manchester Docks.	Total
1897	621,074	231,383	382,211	1,234,668
1898	427,735	217,376	361,488	1,006,599
1899	435,722	266,772	372,105	1,074,599

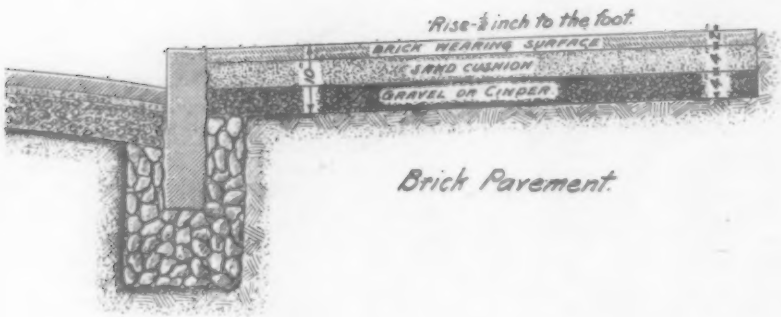
The quantity of sewage treated and proportion of solids brought to the outfall works is in most cases considerably affected by the rainfall. A proportion of the heaviest solids are generally deposited in the sewers during dry weather, from which they are


Rise-¼ inch to the foot
1" of wearing surface
6" PORTLAND CEMENT CONCRETE
10"
COARSE CINDER OR BROKEN STONE
12" x 10"
Broken Stone Drain every 25 ft.

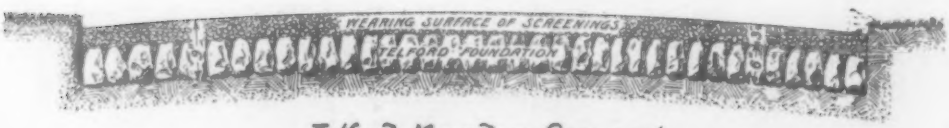
Portland Cement Pavement.



Flag-stone Pavement.



Brick Pavement.



Telford-Macadam Pavement.

Cinder Pavement.

Typical Cross-sections of Pavements for Walks. By Bureau of Engineering and Construction, Pittsburg, Pa.; Geo. W. Wilson, Director, and John Brunner, Superintendent.

dislodged and brought to the outfall in time of storm. At the Manchester outfall as much as 300 tons of solids have been deposited in the precipitation tanks during one day's rain succeeding a period of dry weather. These solids are largely composed of road grit, and other heavy matter, and are easily distinguished from the ordinary precipitated sludge. They lodge in the tanks close to the inlets.

During the year 1897, which was the last year of sludge pressing at these works, 7.12 tons of cake were produced and 1.03 tons of heavy matter which could not be pressed was removed from the precipitating tanks by manual labor per 1,000,000 imperial gallons of sewage treated. The quantity of sludge obtained by chemical precipitation is influenced to a considerable extent by the proportion and kind of chemicals employed.

The works for the treatment of sewage by local authorities are being rapidly completed within the Mersey and Irwell watershed. The last published report of the Joint Committee show that eleven only out of ninety-three urban and rural authorities are now without works in operation. Considerable difficulty is, however, found both by the local authorities and the manufacturers in complying at all times and under all conditions with the required standard of purity. The methods of purification generally adopted are those of chemical precipitation or sedimentation, and subsequent further purification by filtration, the filters being now generally worked intermittently as bacteria beds. There has not yet been sufficient time to obtain results, other than experimental, from extended operations of the improved system of purification under all the varying conditions now existing, most of the works having been only recently completed. At some of the works, indeed, the authorities are not at present filtering the sewage, but are removing the grosser impurities only by precipitation.

The quantity of sewage treated by chemical precipitation at the Manchester works during the year 1898 was 8,644,477,000 gallons, at a cost of £8,528 2s. 10d. The average population contributing to the works during this period was 515,120, and the average daily quantity of sewage treated per head amounted to 46.08 gallons; the quantity of wet sludge produced amounted to 190,794 tons, of which 190,000 tons were deposited at sea, a distance of 60 miles from the works, at a cost of £4,725 5s. 8½d., and 794 tons were pressed into cake at the works at a cost of £33 8s. 3d. A considerable amount of labor was formerly required for the removal of the heavy matter, consisting of ashes, road drift, etc., which was brought down in times of storm and deposited in the tanks as previously described. This material during the past twelve months has been pushed forward by manual labor from the tanks into two ejectors, by which the sludge is forced through a rising main 10 inches in diameter and about three-quarters of a mile in length, into elevated tanks at the canal wharf; it is gravitated thence into the sludge ship. The works for sludge disposal were designed and constructed about three years since, and the superintendent states in his annual report that "the working of the ejectors, sludge mains and tanks has been uniformly satisfactory, no case of blocking of the mains has occurred, although large quantities of heavy detritus have been mixed up with the sludge and sent through the mains to the steamer, thus saving much time and expense in the removal by hand; the tanks have been found capable of discharging their contents by gravity into the steamer in about fifty-five minutes."

Before the steamer was brought into use, the whole of the sludge was pressed, and the cake was tipped on low land adjoining, a proportion only being utilized for agricultural purposes. The work was as a rule carried on continuously. The actual cost for the year 1897 was 7.7d. per ton of wet sludge. Previously the cost of pressing amounted to 3s. 6.4d. per ton of cake produced, equal to 11.5d. per ton of wet sludge. I estimated that the cost of conveying sludge to sea by steamer would not exceed 8.9d. per ton; the actual cost for the year 1898 was only 5.9d. per ton.

Open Spaces in Towns.—The provision of open spaces in towns is a subject that has exercised the minds of most sanitary reformers for many years past. I have endeavored to obtain from some of the large towns in England particulars as to the effect small open spaces have upon the health of the residents in the immediate surroundings, especially in crowded districts, but beyond a general consensus of opinion in favor of the provision of these breathing areas, I regret that no reliable data are obtainable.

The Manchester corporation have for many years endeavored to increase as far as practicable the small open spaces in the thickly populated portions of the city. A considerable number of such areas are now in use, and are in many cases laid out as playgrounds for children, the larger areas being planted and maintained as public gardens. Much care is bestowed upon the city parks and recreation grounds, and notwithstanding the near proximity of chemical and other works, a fair amount of foliage and vegetation is maintained by constant renewals. A portion of the corporation estates situated some five miles outside the city are utilized for nursery purposes, an area of sixty-five acres being set apart for the propagation of trees, shrubs and herbaceous plants. A number of

trees are annually imported from these nurseries in tubs for the purpose of decorating the squares and public buildings of the city.

Although, as already stated, it is difficult to obtain actual figures as to the effect of small open spaces upon the death rate and general health of the surrounding population, there can be no doubt that they exercise a very beneficial effect and improve and brighten the conditions of life in thickly populated areas. The great price of property in the crowded portions of many old cities makes the acquisition of open spaces of large extent practically impossible, and if the value of small open spaces were more generally recognized much might be done in this direction, where larger schemes would fail. In many cases where property has become unsanitary it might be purchased on reasonable terms, the site cleared of buildings and the surface graveled, asphalted, or otherwise laid out as an open space, streets in some cases which are not thoroughfares might be absorbed into the site with advantage; such a scheme would improve the dwellings immediately surrounding by the freer admission of air and light, and should therefore be looked upon with favor by the owners of property in the neighborhood.

CURRENT INFORMATION.

Sewage Treatment Experiments in England.

An interim report, embodying some details which were included in a former report published in December, 1898, regarding the treatment and disposal of sewage of Knostrop, has been issued by the sewage committee of the Leeds corporation. The report opens with a statistical and historical resume, in which Leeds is described as containing, within an area of 21,572 acres, an estimated population of 420,000. The district is hilly, varying from seventy feet above the sea at the river Aire to over five hundred feet, and the whole city, except Rodley and a portion of Bramley, is in one sewerage system, of which the outfall is in the Thorp mill pool, at Knostrop, two and one-half miles from the town hall. A system of irrigation works is now being constructed on a site of sixty acres adjoining the river Aire at Rodley, whose population is estimated at 4,500. The system of sewerage in both parts is that known as the combined, there being no separate drains for surface water. The effluents from tanneries, wool-scouring and dyeing, copper and galvanizing works, which were of large volume, seriously affected the treatment of the sewage.

The policy of the council had been to encourage trade by receiving its effluents, yet it was necessary that their admission should be conditioned upon (1) effective means being taken to precipitate the solids in their refuse; (2) the discharge being so regulated that there should be no sudden rush of a considerable volume, but rather a gradual and steady flow spread over the twenty-four hours; (3) that an inspection manhole should be provided; and (4) that no discharge should be allowed which, either by its temperature or other character, would injure the sewers, promote decomposition, or prejudicially affect the treatment of the sewage. The chief difficulties arose from iron liquor, wool fibre and dye water.

The question of constructing a system of main drainage had been under the consideration of the corporation since 1842, various schemes being discussed. The main sewers were completed in 1855.

The works remained without structural alteration until March, 1897, however, with the exception of the present works of precipitation by lime, which were completed in 1874. The insufficiency of these works is and has been admitted, and for the last four years there has been much pressure put on the corporation by the West Riding Rivers Board to at once improve the treatment at Knostrop and to devise a more satisfactory scheme for dealing with the sewage of the whole city. In the spring of 1892 the council, as a provisional measure pending the settlement of a general scheme, sanctioned the expenditure of $112,000 for the building of seven new precipitation tanks having an area of 2 acres and a capacity of 3,000,000 gals. The effect of this was the production of a better effluent, from which the larger proportion of the solid matter in suspension had been removed, but it was at the cost of a much larger production of sludge, over 400 tons a day (90 per cent. water). It was found impracticable to deal with this huge amount of sludge on the present site, and therefore it had not been possible to utilize all the settling tanks. The value of the sludge as a manure was too low to induce farmers to pay for it, and at times its accumulation became a source of anxiety. It was generally recognized that further purification was necessary and that precipitation must be followed by land or artificial filtration.

In 1894 a committee visited the most important sewage works and farms in the country, when it was decided that broad irrigation was the best process of sewage purification. In Leeds, however, with its

large and growing population, about 4,000 acres of land would have been required if that plan had been adopted, and it was found impossible to carry it out. At the end of 1896 the committee's attention was drawn to the artificial filtration process being tried at Barking and Sutton, Surrey. At Barking biological filtration followed precipitation, while Mr. Dibdin's experiments at Sutton pointed to the possibility of treating sewage on biological lines without the production of sludge.

The report says:

The treatment of sewage resolved itself into two parts: (1) Dealing with matters in suspension; and (2) dealing with matters in solution. Chemical precipitation was concerned mostly with the first, and in actual practice accomplished little in regard to the second. The object of the experiments which had been carried out was (1) a higher degree of purification than could be obtained by mere precipitation, with or without chemicals; and (2) to see how far it might be possible by bacterial action to do away with sludge production, or, at least, reduce it. Artificial filtration was found to bring about the purification of between 75 per cent. and 95 per cent., but was more effective in regard to matters in solution than those in suspension. The experience gained in the period of over two years, during which Leeds sewage had been treated in contact beds, showed that these beds produced variable but very good effluents, whether from crude, screened or partially settled sewage—much superior to those resulting from lime precipitation. The chemical analysis gave a result generally well within the limits which in recent years had been accepted by the Lancashire and Yorkshire Rivers Boards as a provisional standard of purity for effluents going into a stream not used for drinking purposes.

The general conclusion in reference to the experiments at Leeds with contact beds was that, in the conditions and in the material used, it was found impracticable to deal with the crude and partially settled sewage, not because good effluents could not be obtained, but because the capacity of the rough beds could not be maintained, and when accumulations arose a large part of them could not be consumed by resting the beds. If, therefore, contact beds were to be used, the problem would be (1) to find material of sufficiently even size not liable to degradation; (2) to reduce, as far as possible, the solid matter put on to the rough beds; and (3) to exclude and treat separately all iron liquids. As it was, it was found impossible to deal with crude sewage on contact beds without rapid sludging up of the rough beds.

Experiments were tried with closed and open septic tanks as a process preparatory to filtration, by which the bulk of the solids in suspension might be kept off the bed, and probably to a great extent dissolved in the tanks. The working of these experiments is described at length, details being given with regard to the several open and closed septic tanks. The first open septic tank had an area of 6,000 square feet and a capacity of 250,000 gallons. The flow through the tank was such that it would fill in twenty-four hours. With regard to the question of septic tanks—as to whether they should be closed or not—the experience of Leeds showed that more results were obtained from the closed septic tanks than were yet obtained from the open, and that the scum which forms on septic tanks itself soon gave a cheap roof, mainly of value in preserving heat in the sewage—the floating surface being a bad conductor. In the open tanks the gases produced were for the most part inodorous and inappreciable, by reason of the Leeds sewage being diluted by large additions of trade effluents; but no doubt where strong domestic sewage was being treated a greater nuisance would arise. The effluents from open and closed septic tanks were identical, and there was no distinct difference from the chemical point of view. There were considerable advantages from the use of septic tanks—(1) the production of a practically uniform effluent from sewage of such varying composition as that of Leeds; (2) the digestion of part of the solids in suspension, amounting at Leeds to about 40 per cent. of those originally in the sewage; and (3) the anaerobic putrefaction which took place in the septic tanks facilitated subsequent filtration, rendering the filtrates less liable to secondary putrefaction.

In conclusion the report states that the experiments in the biological treatment showed the remarkable purifying effect of bacterial oxidation, and that it was more rapid in dealing with dissolved impurities than with solids in suspension. Double-contact beds gave good results with crude sewage, and excellent results with partially settled sewage or with septic effluent. Single-contact beds were insufficient for dealing with crude sewage, but gave far better results than settled sewage used with septic effluent. The real difficulty with contact beds was to maintain capacity, the hope that accumulation would be dissolved by rest not having been fulfilled. Before finally abandoning contact beds, however, it is proposed to try experiments with beds so constructed that they will pass out undigested matters with the effluent.

Continuous filtration on fine beds appeared to be impracticable on account of rapid choking, but over very coarse material septic effluent and fine sewage had given interesting and remarkable results. It had been found practicable to work coarse continuous beds ten feet deep at the rate of 200 gallons per square yard, or 1,000,000 gallons per acre per day for septic effluent. At this rate results giving over 90 per cent. purification were obtained, and although some solids were retained in the filter, they could be washed out by the increased flow naturally arising with storm dilution. This possibility of dealing with storm waters was an important feature of the system. It seemed practicable to deal at such beds even with crude sewage, but a depth of twelve feet of material would be

required for Leeds sewage, which was not very strong. These latter experiments had not been carried on long enough to allow of the formation of any definite conclusions.

Neither continuous nor intermittent filtration gave rise to any evil odors, and both gave excellent results on analysis, and the effluents improved with keeping. From the bacteriological point of view, however, all the filtrate contained a larger number of bacteria than the standard of numbers allowed for drinking waters. This objection was not very material, and, indeed, the presence of bacteria in the filter might be looked upon as an active element in further purification. In the case of Leeds, where the purified sewage passed into a stream which would scarcely at any time be brought to safe drinkable condition, the presence of considerable numbers of bacteria was not an objectionable feature.

The report is signed by Alderman Harding, chairman of the sewerage committee, City Engineer Hewson and W. H. Harrison, chemist to the committee.

The Typhoid Bacilli in Sewage.

At the recent congress of the British Medical Association, Dr. A. C. Houston contributed a paper on the question "Can Modern Systems of Sewage Treatment Remove the Bacillus, Typhosus and Allied Organisms?" He said the question was whether the modern system of "treating" sewage in septic tanks and bacterial filters could be relied upon to remove or destroy pathogenic germs. He confined his remarks to bacterial filters, because septic tanks, whatever their advantages might be from the chemical and practical point of view, could not, he thought, be regarded as much better than modified cesspools from the point of view of the epidemiologist. The impossibility of the microbes being retained in biological filters would be readily appreciated, and where the attempt had been made to use finer material, with the object of holding back the bacteria, the filters had usually, if not invariably, become choked up. In fact, it might be stated in general terms, and with comparative safety, that the mechanical separation of the micro-organisms in sewage by the use of bacterial beds was virtually impossible. He gave details of the various experiments that had been carried out, which proved that some pathogenic microbes passed through filters in practically undiminished numbers, and they indicated that, until positive evidence to the contrary was forthcoming, it would be wise to regard the effluent from bacterial beds as no more safe in their possible relation to disease than crude sewage. Dr. Houston wished it understood, however, that he was dealing chiefly with the Crossness experiments, and it did not follow that these results had a constant value in the case of all bacterial filters. It was only right to add that, from the chemical and practical point of view, the coke beds at Crossness were highly effluent. The suspended matters were removed; the reduction in the amount of dissolved oxidisable matter was very striking, and the effluents were apparently non-putrescible. An important lesson to be learned from these experiments was that it was doubtful if any bacterial process in practical operation at the present time "treats" or "detains" the sewage for a sufficiently long period to allow of the complete destruction of all the pathogenic germs by bacterial agencies.

Books on Sewage Disposal.

To the Editor of Municipal Engineering:

Sir—In the current number of Municipal Engineering, you publish a letter from Mr. Frank W. Wagner, city clerk of Ashtabula, and in reply to his request for advice in selecting books on sewage disposal, you name several books. Permit me to suggest that you have omitted four valuable publications dealing with this subject—useful books, which your correspondent may care to get. They are: 1. Sewage Irrigation Papers of the United States Geological Survey, in two parts; 2. The Second Report of the Baltimore Sewerage Commission; 3. "Modern Methods of Sewage Disposal," by Waring, and 4. "Sewage," by Rideal, the latest and best treatise on the subject. Respectfully,

G. EVERETT HILL.

New York, Sept. 7, 1900.

Water Works Are Held to Be Real Estate.

A decision was handed down by Judge Moore at Deadwood, S. D., recently, in the case of C. W. Carpenter, D. K. Dickinson and others against the Sturgis Water Co. The water works company decided to issue bonds for $50,000, and after the first $30,000, the bonds were issued in lots of $5,000 each and sold to Colonel Carpenter. Before the last $5,000 was issued, a mortgage was given to D. K. Dickinson of Lead, for $20,000. In the meantime, sundry judgments were obtained against the company by eastern creditors amounting in the aggregate to many thousand dollars. The company failed to make its payments and Colonel Carpenter brought suit. Very little contention arose over the claim of the first mortgage, but a number of delicate questions were brought out in the claims of Dickinson and the judgment creditors, the most important of which was whether or not the water works, mains, engines, dams, etc., were personal property or realty. Judge Moore

held that the first mortgage of Carpenter was good and took precedence over all creditors; that the second mortgage, held by Dickinson, was void on the ground that it was given when the corporation was insolvent. Judge Moore took the view that the property was real estate. The case will be appealed.

Promised Resignation of the Secretary of the League of American Municipalities.

The League of American Municipalities continues to have trouble with its secretary on account of his methods in connection with the finances of the organization. During the last month letters have been received by many mayors from Mayor Johnson of Denver, stating that B. F. Gilkison, the secretary, has agreed to resign and cities which have joined the league have therefore been requested not to pay dues to him. The letter also asks that the treasurer of the league be notified as to whether dues have been paid or not. The executive committee states that it has arranged to fill the vacancy to be caused by Gilkison's resignation.

A Municipal Ball Room.

A municipal ball room was provided for in plans recently submitted to the Cheltenham corporation, in England, by the borough surveyor, for altering and renovating the Winter Garden. The plans included the strengthening and reglazing of the roof, the conversion of the space under the dome into a ball room to meet the requirements of the oncoming winter season, etc. Some of the members protested against the elaborateness of the scheme and its costliness, about $50,000, and the plans were finally carried back to the improvement committee with instructions that no expenditure beyond the repair and renovation of the roof should be incurred without the sanction of the council.

Park Libraries.

The establishment of libraries in the small parks at Brooklyn, N. Y., some time ago, has, it is claimed, raised the tone of the neighborhoods where the libraries are located, and has transformed rough boys into law-abiding citizens. The borough has three of these park libraries in operation. To Tompkins park, which is looked on as a model, about one hundred books are added monthly on an average, and the demand is greater than the supply. The library was patronized in March by 4,000 readers—persons who did not take books out, but read papers and magazines on the premises; in April 2,372 persons took books out and 4,190 books were in circulation—an average of 167 per day—and there were 2,900 readers of current publications. The books called for were, for the most part, histories, biographies and elementary scientific works. This is regarded as remarkable, in view of the fact that a large majority of the patrons of the library are children, most of them of Jewish parentage. In one library during the year when the shelves were open to children, the percentage of works of fiction called for was reduced from 72 per cent. to 56 per cent. of the total issue. At the Bedford park library the demand for books is greater than at the Tompkins park branch, the record for the year being 39,192 books taken home. The monthly increase in the number of borrowers was at least 100, and the monthly average of readers over 4,000.

Asphalt Pavements Damaged by Leaking Gas Mains.

Leaking gas mains are said to be affecting the asphalt pavements of Brooklyn. The hydro-carbons used in enriching the gas, which are solvents of asphalt, so soften it in spots that it breaks up and crumbles, to the loss and injury of the companies which laid the pavements and agreed to maintain them for a term of years. When taken to task for the injury done by their mains the gas companies pass the blame on to the electric railway companies, whose escaping return currents cause corrosion of the gas mains and consequent leakage.

Average Cost of Pavements in Newark, N. J.

In his report Ernest Adam, engineer of the street and water department, Newark, N. J., states that the average cost of pavements during the last year has been as follows: Asphalt pavements, consisting of six-inch concrete base, one and one-half-inch binder course and a two-inch wearing surface, $1.91, including a ten-year guaranty and the Am. Soc. Mun. Imp. clause for condition at end of guaranteed period; granite block paving on a two-inch sand cushion and six-inch concrete base, with gravel and tar filler, $2,357; granite on four-inches of sand, $1,606.

Difference Between Repairs and Reconstruction.

In a decision rendered by the Iowa supreme court, in the case of Farraher vs. the city of Keokuk, reasons are pointed out for allowing the cost of mere repairs to be assessed in a more summary manner than the greater cost of constructing sidewalks. The city engineer of Keokuk has authority to repair sidewalks without notice to the property-owner, and assess the expense thereof, while in case of construction or reconstruction a petition from the owners or a vote of the council may be required. The city engineer testified that

he found 134 feet of sidewalk in great need of repair. Bricks were broken and crushed in places and the walk, which was low, was covered with mud and clay, while holes which held water were all over it. The plaintiff testified that he took all up for 134 feet, redug the trench, put in eleven cubic yards of new sand and relaid the walk entirely for said distance, using about 2,700 new brick, with perhaps some of the old ones in the end of every other row. The city engineer called this a repair and endeavored to justify having it done under his power to make repairs. The supreme court held that it was a rebuilding or reconstruction, and affirms a decree enjoining the sale of the lot for non-payment of the special tax levied against it therefor.

Abridgement of the Powers of Pennsylvania Water Companies.

Judge S. Leslie Mestrezat of the Pennsylvania supreme court, handed down a decision recently in the case of Bly vs. White Deer Mountain Water company, by which all water companies in the state suffer an abridgement of the rights they have been enjoying. A question regarding the validity of the bonds issued by them is also raised and will require curative legislation. It has been the practice of the state department for twenty-five years to issue charters not only for city, borough or township, but also allowing companies to supply water to territory "adjacent thereto." There are over 400 water companies in the state at the present time, many of which have issued bonds secured by a mortgage on their plants, and in a great many cases the mortgage covers the property in the territory "adjacent." In the case in which the decision was rendered the plaintiff is the owner of a grist mill, dam and water power located on White Deer creek, in Union county. He secured from the lower courts an injunction against the White Deer Mountain Water company, the White Deer Creek Water Supply company and others to restrain them from interfering with his riparian and other rights. These companies were both chartered under the act of 1874. The charter of the White Deer Mountain company gives it the privilege of "supplying water to the public in the township of White Deer, Union county, state of Pennsylvania, and such persons, partnerships and associations residing adjacent thereto who may desire the same."

The charter of the White Deer Creek Water Supply company reads "for the purpose of storage transmission, transportation and supply of water for commercial and manufacturing and other purposes in Kelly township, Union county." The plaintiff raises the point that neither company has the right to furnish water outside of the townships of White Deer and Kelly. The supreme court decision, which concurs in that of the lower court, says:

"A water company organized under the act of April 29, 1874, authorizing corporations for the supply of water to the public, with power to maintain works necessary to introduce the water into the town, city or district where they may be located, cannot supply municipalities other than the one named in its charter, and hence has no power to condemn water for such purposes."

Bridges for the Chicago Canal.

The Chicago drainage board is severely criticised by engineers of that city for contracting to pay the owners of the patent rights of the Scherzer bascule bridge $108,000 in royalties on seven bridges, when, it is claimed, a bridge as good, if not superior, could have been built by the sanitary district without a dollar for royalties. The trustees of the sanitary district, in defense of the contract with the owners of the Scherzer patents, say that they were in a position where there was nothing else to do but take the Scherzer design, and in order to save the city $6,000 in royalties on each bridge it was necessary to contract for six.

A Municipal Orchestra.

A municipal orchestra is proposed by the Battersea vestry, England, which has resolved to appoint an organist and conductor, whose duty it will be to train and conduct the proposed municipal choir and orchestra; to organize entertainments arranged by the vestry, and to give organ recitals on the municipal organ at the town hall. Admission will be free.

Track Elevation in Three Cities.

An ordinance for track elevation in Davenport, Ia., has been prepared and is being studied by City Engineer Murray. The ordinance was prepared by E. E. Cook, the counsel for the C., E., I. & P. railway company. This company about three years ago became tired of the grade crossings and appealed to the city council for permission to erect a Y switch, which is now in operation. The success of this switch raised the question of track elevation, the company reasoning that the cost of one life warrants its construction. The suits emanating from grade crossing accidents would cost, in defending and paying judgments, more than the cost of the construction of elevated tracks.

An ordinance for the elevation of the Central railroad company's tracks in Bayonne, N. J., is also contemplated. The railroad companies with roads running into Joliet, Ill., are willing to elevate their tracks without compelling that city to be urgent in the matter.

Study of Street Hygiene.

The International Congress of Hygiene and Demography, which met in Paris, France, Aug. 12, appointed a new committee on street hygiene, which will make investigations and report at the next congress, to be held in Brussels in 1903 or 1904. The result of its labors will be published quarterly or semi-annually in Berlin. The officers are: President, Andreas J. Meyer, city engineer, Hamburg; vice-president, H. Alfred Roechling, Leicester, England; general secretary, Prof. Theo Weyd, Berlin.

Grand Prize for Municipal Engineering.

Under date of August 31, 1900, A. S. Capehart, Director of Liberal Arts and Chemical Industries of the Paris Exposition, announces that the grand prize of the Exposition was bestowed upon Municipal Engineering on account of its merit as a publication.

Technical Meetings.

The tenth annual convention of the association of Railway Superintendents of Bridges and Buildings will be held in St. Louis, Mo., Oct. 16, 17 and 18.

The fourth annual meeting of the Central States Water Works association was held at Columbus, O., Sept. 4-6. A committee was appointed, with F. A. W. Davis of Indianapolis as chairman, to work with committees from other societies to secure legislation against electrolysis. Officers for the enusing year were elected as follows: President, Mr. Harvey Cockel, Columbus, O.; Vice-Presidents, Messrs. Joseph J. Pater, Hamliton, O.; Quince Walling, Muncie, Ind.; Fred Catlin, Flint, Mich.; Wm. H. Glore, Covington, Ky., and Clark Howles, Charleston, W. Va.; Secretary, Wm. Allen Veach, Newark, O.; Treasurer, Mr. Chas. E. Rowe, Dayton, O.; Executive Committee, Messrs. Jerry O'Shaughnessy, Columbus, O.; Geo. Hornung, Newport, Ky., and C. W. Wiles, Delaware, O.; Finance Committee, re-elected; Editor of Proceedings, Mr. Lehman B. Holt, Cleveland, O. The next annual convention will be held at Evansville, Ind. In a paper on "Stone Masonry for Water Works Plants," Chas. A. Hague, M. Am. Soc. C. E., New York City, said that he preferred American Portland cement to the foreign brands. He urged the importance of seeing that contractors make themselves thoroughly familiar with the specifications under which they are working, instead of following preconceived notions.

M. N. Baker of New York city presented a paper on "Uniform Municipal Reports." He advocated state supervision of municipal accounts, and the adoption of uniform schedules for summaries of statistics in annual reports were suggested as steps towards improving these conditons. A committee of three was appointed to carry out the suggestion of the paper, consisting of W. A. Veach, Newark, O.; W. B. Mitchell, Piqua, O.; Fred J. Catlin, Flint, Mich. In a paper on "The Causes of Tastes and Odors in City Water," J. S. Haven, New Haven, Conn., said that a great mistake has been made as to the causes of tastes and odors in water.

The National Municipal League holds its convention in Milwaukee, Sept. 19, 20 and 21. Officers for the ensuing year were elected as follows: President, James C. Carter, New York city; first vice-president, Charles Richardson, Philadelphia; treasurer, George Burnham, jr., Philadelphia. Some of the papers presented were: "Does the Model Charter Confer Dangerous Powers on the Mayor?" Charles Richardson; "The Model Charter of Small Cities," Prof. Samuel C. Sparling, of Madison, Wis.; "An Essential Safeguard to Executive Responsibility," George McAnery, New York city; "The Influence of the Public Service Companies on City Government," Rev. Dr. Gladden, Columbus, O.; "Representation of Different City Interests in the Council," William Dudley Foulke, Richmond, Ind.; "The Government of the City of Glasgow," Rev. Albert Lazenby, Chicago; "The Essential Element in Good City Government," Charles J. Bonaparte, Baltimore; "Danger of the Commercial Spirit in Politics," Bird S. Coler, comptroller of Greater New York; "Local Transportation and Its Relation to the Welfare of the Municipality," George E. Hooker, Chicago; "Municipal Political Parties," Dr. Milo R. Maltbie, New York city; "Municipal Accounting," M. N. Baker, New York city.

The seventh semi-annual meeting of the Municipal League of Indiana will be held at Richmond, Ind., Oct. 10, 11 and 12. The officers of the league are: President, Z. T. Dungan, mayor of Huntington; secretary, Clarence W. Genn, councilman, Richmond; treasurer, A. P. Beatty, mayor, Decatur. Papers will be read and discussed as follows: "City Sanitation," Mayor H. Kerlin, Delphi; "How Best to Serve the Co-Operation of the Police of the State of Indiana Without Affecting Local Control or Materially Increasing the Expense," George A. Harrison, superintendent of Police, Lafayette; "Mayors, Their Powers and Duties," Thomas Merriman, Decatur; "Streets, Life of the Best Street Material," H. L. Weber, city engineer, Richmond; "Municipal Ownership," W. H. Stambaugh, Ft. Wayne; "Garbage," Mayor H. P. Schever, Ft. Wayne; "Public Parks," Mayor Thomas Taggart, Indianapolis.

The nineteenth annual meeting of the New England Water Works association was held at Rutland, Vt., Sept. 19 and 20. Morris Knowls presented a paper on Pittsburg

filtration experiments and Robert Spurr Weston read one on similar experiments in Washington. Other papers read and discussed were as follows: "Some of the Physiographic Features Which Affect Our Water Supply," John H. Washburn; "Electrolysis," F. A. W. Davis, Indianapolis; "Bacterial Methods Used in England for the Treatment of Sewage so as to Prevent the Pollution of Rivers and Streams," Prof. Leonard P. Kinnicutt; "Landscape Problems in the Improvement of the Spot Pond Reservoir, Metropolitan Water Works," Frederick Law Olmsted. W. J. Sando submitted a report on the contract trial of a 30,000,000 gallon pumping engine at the Chestnut Hill high service pumping station of the Metropolitan water works.

Municipal Reports.

Mayor's Message and Annual Report of the City of Portland, Ore., for the year ending December 31, 1899.

In the message of Mayor Storey there is a suggestion of general applicability that an effort be made to induce representative citizens to attend meetings of the common council. He found this to be a practice in San Francisco and Seattle where council meetings are largely attended by interested taxpayers. He very properly says that as every act of the council is either for or against the taxpayers whom they represent, and to whom they are responsible, it is important that representative citizens should be present at meetings in which they are so largely concerned. There is no doubt that if such interest were shown in municipal government it would result in great improvement in the management of municipal affairs.

City Engineer Chase in discussing the need of better pavements in Portland, favors stone block for durability on account of climatic conditions. He expects good results from the use of vitrified brick, but says that those manufactured in the vicinity of Portland have not yet come up to the requirements, which, however, may be accounted for by the fact that the making of the brick has thus far been in an experimental stage. He says that wood blocks are regarded by citizens of Portland as a failure, but he does not share this opinion. On the contrary, he believes that if properly constructed a wood block pavement will answer all the requirements, and he thinks that economy requires that the blocks receive some kind of treatment to preserve them from decay.

Annual Report of the General Superintendent of Works and the Board of Street and Water Commissioners of the City of Newark, N. J., for the year 1899. J. Crowell Mundy, Genl. Supt. Works.

Mr. Mundy complains that the appropriations for street cleaning in Newark have not been increased in the last ten years in proportion with the mileage of streets to be cleaned. He sets forth figures showing that the street cleaning appropriation for a mile of paved streets in 1890 was $1,760.56, and this has gradually declined until in 1899 it was $970.58, a difference of nearly 100 per cent. The cost of street cleaning in New York City is over $5,000 per mile per annum, but notwithstanding the difference of appropriation the citizens of Newark demand as clean streets as those of New York City. He is convinced that the most efficient and economical method of street cleaning and the one which causes the least inconvenience to the public is the use of sweeping machines at night.

Municipal Manual of the City of Altoona, Pa., for the Fiscal Year 1900-1901. Compiled by W. J. Hamor, City Clerk; Harvey Linton, City Engineer.

This manual, which is published in vest pocket size, gives condensed information, statistical and otherwise, regarding the public affairs of Altoona, embracing such matters even as instructions regarding the tapping of sewers, manner of making street improvements, and contains also a brief description of the Altoona sewage disposal plant.

New Publications.

"Monopolies and the People," by Chas. Whiting Baker, C. E., Editor of Engineering News. Third edition, revised and enlarged. Octavo, cloth, 368 pp. No. 59 of "Questions of the Day." G. P. Putnams Sons, $1.50.

The first edition of this book was written in 1889 and this volume consists of the former work slightly revised and about a hundred additional pages with reference to the development of the subject during the past ten years. The first thing noticed is a certain looseness of definition which makes unnecessary confusion to the reader in some portions of the argument, though the course of the author's reasoning is perhaps not seriously affected by it, the underlying idea being clearer than the expression of some phases of it. An example of this is the frequent statement that a trust is a monopoly. Under any strict definition of monopoly this is not true. Some trusts are formed to operate monopolies, some intend to create and operate monopolies, while still other trusts, properly so-called, are not conected with any form of monopoly. The author makes his classification of monopolis without reference to their fundamental character, but according to the classes of industries or lines of activity in which they are developed. Thus successive chapters discuss Monopolies of Mineral Wealth, of Transportation, Municipal Monopolies, Monopolies of Trade, Monopolies depending on the government, Monopolies

in the Labor Market, Monopolies and competition in other industries. It is evident that there is a more basic classification latent in his thought, but it is nowhere formulated, and the entire discussion, and especially the nature of the conclusions drawn in chapter XVI suffer from the failure to bring out and apply the deeper lying principles of which he evidently has a good understanding.

The discussion is very interesting and is particularly valuable because it shows the results of careful study by a practical man of the operation of trusts of many of the classes mentioned, and give many statements of fact which are more than usually reliable; and while we cannot follow the author to his conclusions, his data are so well in hand and his discussion is so fair and unprejudiced that it is easy to see where the difference arises and to use with confidence his statements and arguments as a basis for further development. Space will not permit this here.

The Proceedings of the Twelfth Annual Meeting of the Iowa Engineering Society. L. Higgins, Secretary. Price, 50 cents.

The report embraces papers on the "Iowa State College Sewage Disposal Plant," by Profs. A. Marston, J. E. Weems, L. H. Pamell; "Notes on Location of Railways," L. H. Stone; "Problems in Surveying," Seth Dean, and "Fan Heating and Ventilation," Lafayette Higgins, together with committee reports.

Personal Notes.

D. F. Cordrey has resigned his office as city engineer at Elkhart,, Ind.

William C. Cattel has been elected borough engineer at Wenonah, N. J.

Charles L. Fuller, city engineer at Troy, N. Y., for thirty years, died Sept. 14.

O. W. Holl has been appointed principal assistant city engineer at Canton. O.

Captain George Platt, city engineer for several years at Erie, Pa., died Sept 8.

F. L. Sikes has been elected superintendent of water works at Portsmouth, O.

George D. Gilbert, city engineer of Corry, Pa., for a number of years, died Sept. 15.

John Mulva has been elected mayor at Oshkosh, Wis., to succeed the late J. H. Merrill.

Mayor Hugo has been declared mayor at Duluth, Minn., by a decision of the supreme court.

J. W. Carson, superintendent of the Columbus Face Brick company, Shawnee, O., died Aug. 21.

William R. Wilkin has been elected city clerk at Steubenville, O., to succeed George P. McCrackin.

William G. Stone has resigned as engineer of the new sewerage system at Whitesboro, N. Y.

Capt. R. H. Peek, city engineer at Galveston, Tex., was drowned Sept. 10, during the severe storm in that city.

Professor W. F. M. Goss of the department of mechanical engineering of Purdue University, Lafayette, Ind., has been appointed dean of the engineering schools of that institution.

The Hon. William L. Golding, mayor of Marion, Ind., died Sept. 10 of asthma and heart trouble, aged fifty-six years.

Morris Knowles, Assoc. M. Am. Soc. C. E., has resigned his position as a member of the water board at Lawrence, Mass.

Frederick W. Kafer has been appointed assistant professor in the department of civil engineering at Princeton university.

John A. Cole, Chicago, has been selected by the water company of Topeka, Kas., to estimate the value of the water plant.

L. L. Buck, chief engineer of the new East river bridge, has been compelled to give up the work of his office temporarily, owing to ill health.

Claude S. Haynes has been appointed assistant engineer on the staff of the Croton aqueduct commission of New York City.

August Ziesing has been appointed general western representative of the American Bridge company, with headquarters in Chicago.

J. Chambliss Doyle, vice-president of the National Building Supply company, Baltimore, Md., died at Charmain, Pa., Aug. 12, aged thirty-nine years.

Geo. T. Bouton, clerk of the street and water board of Jersey City, N. J., for a number of years, was stricken with paralysis in his office Sept. 17.

Maj. Joseph Gorlinski died in Salt Lake City, Utah, Sept. 1, aged seventy-five years. He had practised as an engineer and government surveyor in Salt Lake City since 1869.

Thomas R. Crowell has been elected city engineer at Lebanon, Pa. This is Mr. Crowell's second election to this office this year, the first election having been declared illegal through some technicality.

Charles F. Chase, New Britain, Conn., has resigned his position in the estimating department of the Berlin Iron bridge company, to become the Connecticut representative of the Boston bridge works.

M. K. Miller, San Francisco, Cal., has been appointed consulting engineer for the city of Oakland, Cal., in the suit of the Contra Costa Water company against that municipality.

Arthur H. Ford has been placed in charge of the course in electrical engineering at the university of Colorado, Boulder, Col., to fill the place of Prof. George H. Rowe, who has been granted a leave of absence for one year.

Wellington R. Vedder, assistant city engineer of Syracuse, N. Y., and Alex Reed, Vice-President of the United States Wood Preserving company, of New York, visited Indianapolis, Chicago and Milwaukee during the third week of September for the purpose of examining into the merits of wood block pavements.

Henry H. Quimby, M. Am. Soc. C. E., has resigned the office of chief engineer of the Phoenix Iron Works to engage in business in Philadelphia as consulting and designing engineer and machinist. The company, which will be known as the Quimby Engineering company, will be located at 915 Ridge-ave.

SELECTIONS FROM THE PRESS.

Municipal Improvements.

The American Society of Municipal Improvements, which held its seventh annual meeting at Milwaukee recently, took three steps which are regarded as especially important. It acceded to the request of the National Brick Manufacturers' Association for the appointment of a joint conference on brick pavements; it voted a request to the National Municipal League that the next annual meetings of both societies might be held at the same time and place, and it appointed what is alleged to be "a promising new committee to co-operate with similar ones from other societies in a grand effort to further uniform accounts and reports and the collection of national municipal statistics."

It is a significant fact that public improvement societies of one sort or another rarely command the general and continued interest which their aims would seem calculated to insure. Despite our proverbial "interest in politics," people in general lack in matters of actual administration that sustained attention upon which the theory of democracy so strongly presumes, and the indifference or incompetence of officials is often a reflection of this fact.

The society in question, however, has behind it a creditable record in behalf of more scientific methods in municipal administration, and whether it continues in its present independence or is merged with certain other similar efforts into an American association for the advancement of municipal government, its continuance is plainly to be desired.

The need of some organization intended to foster acquaintance and emulation between different cities in the matter of public improvement was never more evident than today.—Chicago Tribune.

Fifty Millions for London Streets.

No city in the world is undergoing such vast changes on its surface as are now taking place in London. The improvements in the Strand, the new street from Holborn to the same famous thoroughfare, the Westminster scheme, the Southampton-row widening and the numerous local improvements in connection with tramway development all over London, constitute a budget the importance of which has never been equaled in the history of the city. Very few people are aware of the actual amount that is being spent in this department of London local government. As a matter of fact the sums already voted by the council, and contributed to by the local authorities, amount to the huge gross total of over $50,000,000, representing, after recoupments from the sale of site, etc., a net outlay of close upon $30,000,000.

The importance of these figures can best be ascertained by a comparison with the work, under this head, accomplished by the Metropolitan board of works. During its thirty years of existence that authority spent upon street improvements, including that of the embanking of the Thames, a sum of $57,584,870, or an average annual expenditure of about $1,745,000. The county council has been in existence twelve years, but the improvements of which we are speaking have practically all been sanctioned within a third of that period. Even assuming that they have been spread over the whole twelve years, however, the county council average comes out at close upon two and a half millions. Thus it will be seen that the county council has recognized even more than did the board of works, its obvious duty of replacing the narrow and generally inconvenient thoroughfares with streets better adapted to meet the requirements of modern city life.

The council's policy, on this question of improvements, has been of exceptional interest. In its earlier experience the council was impressed—as any progressive institution must have been impressed—with the enormous injustice of the present system of taxation. It held that those chiefly benefiting by these enormous improvements should pay the material share of the cost, and in its enthusiasm for a principle it declined for some years to proceed with the necessary street improvements until a reform had been effected. Led by the late Mr. Charles Harrison, it fought exceedingly hard for its ideal, and it was mainly through this gentleman's efforts that the betterment principle was introduced. As a principle, the betterment system is admirable, but its practical results in London have so far not been completely ascertained.

The London county council, therefore, eventually reached a deadlock. Either it was to temporarily abandon its ideal of the taxation of ground values, or it was compelled to block indefinitely the carrying out of the much-needed improvements of London. Very wisely, we think, it chose the former course, and the present council is making up for lost time. That the improvements which it has sanctioned are necessary no one can dispute; that they are and must be costly is equally apparent, but the people of London will think that the expenditure is fully justified by the circumstances.—The London Municipal Journal.

Financial Plans of the National Asphalt Company.

According to a circular issued by the stockholders of the Asphalt Company of America, formed in 1899, the National Asphalt Company, incorporated in New Jersey in May, 1900, will absorb the Asphalt Company of America and various other companies. The National Asphalt Company will have $22,000,000 capital stock, divided into 200,000 shares of 6 per cent. cumulative preferred stock of the par value of $50 each and 240,000 shares of common stock of the same value. Beside its stock it will have $6,000,000 of 5 per cent. fifty-year collateral gold certificates. The Asphalt Company of America has $30,000,000 of stock, of which $6,600,000 is paid in. In addition the National Asphalt Company contemplates the acquisition of the capital stock of the Pennsylvania Asphalt Paving Company, which amounts to $250,000; $1,400,000 of the $2,375,000 common stock of the Gilson Asphaltum Company of New Jersey; the $100,000 capital stock of the New Jersey Mexican Asphalt Company, which owns leases of properties near Tuxpan, Mexico; the $500,000 capital stock of the Manhattan Trap Rock Company, which owns quarry lands at Upper Nyack, N. Y., and titles to three asphalt deposits on the east shore of the lake of Maracaibo, Venezuela. The Gilson Asphaltum Company has $275,000 of preferred stock and $275,000 of 5 per cent. bonds outstanding. It controls the Gilson Asphaltum Company of St. Louis and the Gilsonite Roofing and Paving Company of St. Louis.

The National Asphalt Company contemplates using its $6,000,000 of gold certificates, $4,200,000 of its preferred stock and $6,000,000 of its common stock to pay for the Asphalt company of America and $3,550,000 of preferred stock and $5,100,000 of common stock to pay for the other properties and keep $2,250,000 of preferred stock and $900,000 of common stock in its treasury. The combination will be concluded in the beginning of 1901.

Tensile Strength of Buckeye Portland Cement.

The Buckeye Portland Cement company, Bellefontaine, Ohio, has issued a little booklet of pocket size giving much useful information in condensed form on the subject of "How to Use Portland Cement." Cement workers generally will find it valuable. In connection with the general information tests of Buckeye cement are set forth covering a period of from seven days to twelve years, made under the superintendence of S. A. Buchanan, C. E., chief engineer of the bridge department of the Champion Iron company, Kenton, Ohio, and Jas. Wonders, C. E. The briquettes were all of equal density, being made by Boehme hammer apparatus. They were kept in air 24 hours and in water several years. The water in which the old briquettes were kept was accidentally allowed to freeze solid, in which condition it was kept for a month. The tensile strength per square inch increased each year and ranged from 424 to 1,305 pounds, one briquette reaching the latter figure without breaking.

New Molds for Combined Curb and Gutter.

Edward W. Seamans, Grand Rapids, Mich., was granted letters patent on August 21 for a new mold for forming curbs and gutters. The invention consists of a combination arrangement of planks forming longitudinal walls of the mold and transversely-arranged sheet-metal dividing-plates, the planks and plates being detachably and adjustably connected. Mr. Seaman's molds are remarkably simple in their arrangement and will doubtless come into popular use among cement workers.

Files of Business Catalogues.

The Society of Mechanics and Tradesmen, 24 W. Forty-fourth-st., New York city, has added a new department to the library to be composed of catalogues of all kinds connected with building, contracting, machinery, supplies, etc. The catalogues are to be kept on file, properly indexed and will be accessible at all times to persons desiring to examine them. They will constitute a part of the library, which now comprises over 100,000 volumes and is free to all applicants. In order to facilitate obtaining these catalogues Mr. John J. Donovan of the committee, requests through Municipal Engineering that all manufacturers and others who desire to have their printed matter on file, send copies to the librarian at the address given. Mr. Donovan states that this arrangement will entail no expense and will enable those who place their printed matter on file to have it accessible to over 1,000 of the leading business men, who are members of the Society, besides the thousands of others who are constantly making use of the facilities afforded.

A Concrete Mixer.

A new device for mixing concrete consists of a cylinder mounted on a pair of wheels and geared to be revolved as the cart is drawn along. It is recommended by the inventor that the cement and sand be first shoveled into the cylinder, and handed fifty or sixty feet to the stone pile, where stone and water are added, and again mixed by the revolving of the drum on the way to the place of deposit for the concrete. The devices for setting the cylinder for filling and for dumping are very convenient. This piece of apparatus promises well especially for

street work, for which it seems to be peculiarly well adapted. It should be possible to fix the distances to be traveled or the number of turns of the cylinder, as to insure thorough mixture of the sand and cement and afterward of the concrete.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.

656210, Aug. 21, 1900.—Street Sweeper. Alphonse Piton, Quebec, Canada. A machine particularly designed for sweeping car tracks and provided with rotary ice cutters as well as the usual rotary broom.

656221, Aug. 21, 1900.—Method of Producing Artificial Stone. Edmond J. Seymour, Benton, La. A method consisting of placing the wet composition in a mold and scraping off from the top of the mold the surplus as it appears from time to time owing to expansion during drying.

656317, Aug. 21, 1900.—Road Grading Machine. Robert Burke, Anderson, Ind. A machine of the diagonally-placed-scraper type provided with peculiar adjusting means.

656951, Aug. 28, 1900.—Building. Charles F. W. Doehring, Philadelphia, Pa. An interior partition the base of which is corrugated sheet metal, which is suspended from the ceiling girders instead of being supported upon the floor beams.

657122, Sept. 4, 1900.—Lift Bridge. Francois La Pointe, Chicago, Ills., assnr. two-thirds to Albert G. Scherer and William Bretsnyder, same place. The swinging span is supported successively upon a series of separated parallel centers.

657146, Sept. 4, 1900.—Apparatus for Filtration. James E. Williamson, New York, N. Y. The supply valve of the settling tank is quick acting and so arranged as to be quickly closed when the water level reaches the desired point.

657264, Sept. 4, 1900.—Construction for Subways. Horace B. Camp, Akron, Ohio. A portion of the wall of the subway is composed of perforated blocks, the perforations of which are arranged in alignment so as to form continuous conduits.

657799, Sept. 11, 1900.—Process of Making Asphaltic Composition Powder. William W. Varney, Baltimore, Md. The asphalt is rendered fluid by means of heat and a solvent; the sand or other material is then introduced and the solvent then removed by continuous heating.

657802. Sept. 11, 1900.—Cement Curb Mold. Christopher H. Watson, Riverside, Cal. The retaining plates are adjustable toward and from each other by means of cams so as to facilitate the easy removal after the curb has settled.

657827, Sept. 11, 1900.—Metal Lath Attachment and Support. William McCall, San Francisco, Cal.

657980, Sept. 18, 1900.—Pile Holder for Pile Driving Machines. Joseph G. Falcon, Evanston, Ill.

657995, Sept. 18, 1900.—Sheet Metal Flooring. Frank Voigtmann, Chicago, Ill. The sheet metal is corrugated into a peculiar cross-section so as to form keys which will retain the cement topping.

657996, Sept. 18, 1900.—Fireproof Window. Frank Voigtmann and Silas H. Pomeroy, Chicago, Ill. Immediately above the upwardly moving sash is a weight heavier than the sash, which weight is supported by a destructable support which will be burned so as to allow the weight to automatically close the sash.

658167, Sept. 18, 1900.—Snow Compresser. William Westlake, New York, N. Y. A machine for rolling and compressing freshly fallen snow into cakes which can be readily removed.

Trade Notes.

—Asphalt—

The Federal Oil and Asphaltum company has been incorporated, with main offices at South Bend, Ind. The directors of the company are: Frank G. Conklin, Daniel M. Shively, Alberta A. Fulk, William G. Crabill and Dudley M. Shively.

Hetherington & Berner, Indianapolis, Ind., submitted the only bid for an asphalt plant for Detroit, Mich. Their bid was as follows: Building, 28x63 ft., with plant of 1,325 yds. of asphalt a day, with two mechanical agitators and one kettle, $9,744. Schillinger Bros. of Chicago submitted specifications for a portable plant to cost about $4,000.

The Luten Engineering and Construction company of Grand Rapids, Mich., has assigned its interest in the contract secured by it in that city for asphalt block paving to the Lake Erie Asphalt Block Co. The contract is now about half completed.

The Texas Asphalt Paving company, San Antonio, Tex., has been incorporated by J. H. Briggs of Cline, J. P. Nelson, J. S. McNamara, San Antonio

—Brick.—

The Logan Brick company, Logan, Ohio, has been incorporated to manufacture the Logan paving block, by A. A. Reilly, Frank I. Isbell and E. R. Simon.

The contract for furnishing the city of Columbus, Ohio, with 200,000 brick for street repair purposes was awarded to the Nelsonville Sewer Pipe company, Sept. 10, at $13.50 per thousand.

Saul & Kruger, pressed brick manufacturers of Sherman, Tex., will put in an equipment for the manufacture of vitrified paving brick.

The Brooklyn Brick and Sewer Pipe company, Brooklyn, N. Y., has been incorporated by Fred Johnson and H. Fordham of New York city and George D. Beatty of Brooklyn.

The Union Brick company has been organized at Monterey, Mexico, to manufacture building and paving brick and sewer pipe.

The Central Electric company, Louisville, Ky., has been incorporated by J. S. Carill, P. M. Gelatt and W. C. Hines, to manufacture electric supplies.

Newly incorporated electric light companies: Henderson lighting company, Henderson, N. C.

—Machinery—

The O. S. Kelly company, Springfield, O., secured the contract for furnishing Stillwater, Minn., with a 30,000 pound steam road roller, together with a steel harrow, for $3,100.

—Cement—

There is every indication, according to the

recent reports, of the existence of suitable raw materials for the manufacture of cement on the island of Porto Rico.

The Three Rivers Portland Cement company, which was organized recently at Three Rivers, Mich., will invest $3,000,000 in its proposed plant.

T. P. Lindhart has purchased 450 acres of land at Demopolis, Ala., and will erect a cement plant. R. P. Knox, Demopolis, is interested.

The establishment of a cement and lime plant in connection with the Pratt quarries, three miles north of Janesville, Wis., is contemplated.

The Portland Cement company, Ithaca, N. Y., has purchased a site for a cement plant consisting of several buildings.

The plant of the Burns Cement company, Burns, Kas., is being enlarged.

The Sand Lake Cement company, Hillsdale, Mich., will erect a plant at Sand Lake, three miles west of Hillsdale.

The proposed cement plant at Wellston, O., will be in operation by February 1, 1901. Lou Barnes is one of the promoters.

The Nazareth Cement company, Nazareth, Pa., has been incorporated by G. F. Coffin, H. G. Seip and A. Sausser of Easton, Pa., and David Wallace, J. F. Harrison, jr., F. A Strattan and P. H. Hampon of New York.

A series of explosions occurred in the works of the Banner cement mills, north of Jeffersonville, Ind., Sept. 17, killing one man and injuring four.

—Sewer Pipe—

The California Sewer Pipe company, Vernon, Cal., is repairing, improving and enlarging its plant.

The Brick Manufacturing plant of Stratton Bros., Toronto, O., is being converted into a complete sewer pipe factory.

The San Antonio Sewer Pipe company, San Antonio, Tex., has been incorporated by Aaron French, D. C. Noble, C. Upson, T. B. Palfrey and G. S. McElroy.

Newly incorporated water companies: The Currier Water company, Pomona, Cal.; Merryfield Water company, Colton, Cal.; South Park company, Buffalo, N. Y.; Fair Oaks Water company, Sacramento, Cal.; Dalton Canyon Water company, Los Angeles, Cal.; Cypress Avenue Water company, Irwindale, Cal.

—Miscellaneous—

The Ohio River Bridge & Ferry Co., Marietta, O., has been incorporated to build and operate bridges across the Ohio river at Marietta.

The Mexican Clay Mfg. Co. will build a large clay working plant in the City of Mexico. The New York office is located at 39 Courtland-st.

The American Cement Tile Co., Pittsburg, Pa., has been incorporated by James Freund of Detroit, Mich., and Aaron Cohen and Marcus Rauh of Pittsburg.

The Jeffrey Manufacturing company, Columbus, O., announce that their complete chain catalogue is now ready for distribution, copies of which will be furnished free on request.

The Jeffrey Manufacturing company, Columbus, O., was awarded a gold medal at the Paris Exposition covering its line of lifting, conveying and mining machinery. Their exhibit was one of the conspicuously notable features of the United States display in this department.

In a decision handed down recently, Judge Townsend of the United States circuit court of Connecticut, sustained the three Tesla patents numbered 381,968, 382,280 and 382,279. The suit was that of the Westinghouse Electric & Mfg. Co. against the New England Granite Co.

The Geo. V. Cresson company, of New York, has issued a new catalogue of seventy pages devoted to the rock and ore breakers manufactured by them under patents of C. G. Buchanan, C. E., in which all features of this machinery are described and illustrated. The firm particularly emphasizes its work in the construction of large crushers 24x36 and 24x72 in size.

Jos. Lay & Co., Ridgeville, Ind., have issued a new catalogue of their brooms and brushes, which are illustrated and described so as to give the fullest information to those interested in buying goods of this kind. In the introductory of the catalogue the firm says: "Pioneers in the heavy and mill broom business, the first to use bamboo fibre in the making of brooms and brushes and the first to use the well known bass and rattan fibres in the making of street and push brooms, we feel a pardonable pride in having created a line of goods of sufficient merit to attract to our books the largest and best firms of the country, some of whom have been with us for twenty years."

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Brazil, Ind.—The Central Trades and Labor Union passed a resolution Sept. 20th placing the Indiana Paving Brick company and contractors of the various gravel roads in their city on the unfair list, declaring that the former is not complying with the contract made with the labor union when the strike was settled at the plant some months ago, and that the latter are discriminating against organized labor. The county commissioners were denounced for leniency in dealing with the contractors.

Elkhart, Ind.—The council voted, Sept. 12, to refuse to accept the asphalt pavement laid by the Central Bermudez company of Indianapolis, until the specifications and contract shall be complied with. The work was completed last October. Immediate acceptance was waived, as certain defects became noticeable, and it was decided that proceedings be suspended until the approaching winter should develop all defects. The company now maintains that the pavement is in satisfactory condition except in minor features, which the company's bond will protect. The company will

probably have to apply to court to enforce acceptance of and payment for the work. The work cost $60,000, and one or two property owners have settled pro rata with the company, being satisfied with the work in front of their property.

CONTEMPLATED WORK.

Colquet, Minn.—This village contemplates macadamizing the streets.

Cedar Rapids, Ia.—Asphalt paving is contemplated for Fifth and Fourth-aves.

Schenectady, N. Y.—An ordinance has been passed to pave Lafayette-st. with asphalt.

Westerly, R. I.—The committee voted recently to appropriate $6,000 for paving Main-st.

Newark, N. J.—Brick paving is proposed for Mt. Prospect-ave., from Abington to Elwood-ave.

Carnegie, Pa.—The question of issuing $35,000 street improvement bonds will be voted on.

Jackson, Mich.—Resolutions have been passed for cement blocks in a number of streets.

Hamburg, Ia.—This village voted Sept. 20 to pave Buffalo-st. with block.

Anaconda, Mont.—Paving is contemplated for Wyoming, Montana and East Park-sts. next year.

Lafayette, Ind.—An ordinance has been adopted to pave First-st. with brick, with cement walks.

Bushnell, Ill.—The property-owners in E. Hall and W. and E. Main-sts. have petitioned for paving.

Lockland, O.—The question of issuing $40,000 street improvement bonds will be voted on Oct. 1.

Austin, Tex.—The city council appropriated $7,500, Sept. 17, for improving the streets.

Denver, Col.—Plans are being prepared for 18 miles of curbing. H. F. Merryweather, asst. cy. engr.

Hamburg, N. Y.—An issue of $4,500 bonds for brick paving on Buffalo-st. has been favorably voted on.

Bellaire, O.—An ordinance was passed Sept. 11 to pave Walnut alley with brick. F. A. Jackson, cy. clk.

Richmond, Ind.—The residents of N. Tenth-st., between Main and N. E.-sts., will petition for asphalt pavement.

Harrison, N. J.—Brick paving is contemplated for Grant-ave., from E. Newark line to Hamilton-st.

Tomah, Wis.—The common council has ordered stone curbing and gutter laid on Superior-st. this fall.

Baltimore, Md.—Mayor Hays advocates, in his anual message, the $5,000,000 loan for constructing smooth pavements.

New Orleans, La.—About 17,000 sq. yds. of asphalt paving on Third-st. is contemplated. R. M. Harrold, cy. engr.

Youngstown, O.—Resolutions were adopted Sept. 10 for paving S. Hazel, Phelps, W. Front and other streets.

Seaford, L. I., N. Y.—The town highway commissioners have decided to improve the road leading from Seaford to Wantagh.

Waterbury, Conn.—An appropriation of $10,000 has been recommended for grading and gutters on a number of streets.

Cannonsburg, Pa.—Rural free delivery of mail matter has resulted in a measure for better roads in this district.

Hinckley, Minn.—The town board has voted to expend several thousand dollars this season for roads and bridges.

Jacksonville, Fla.—The city engineer has been directed to prepare estimates for paving Adams, Duval and Catherine-sts.

Marion, Ia.—The question of macadamizing E. Seventh-ave., from Thirteenth to Nineteenth, is being considered.

Toronto, Ont.—Engineer Rust has recommended block and macadam paving and concrete walks for a number of streets.

New Brighton, Pa.—Paving is contemplated for upper Eighth-ave., between Seventeenth-st. and the borough line.

Grand Rapids, Mich.—Resolutions have been passed for paving Canal-st. with asphalt and New England-place with brick.

North Toronto, Ont.—A tar or plank walk on Merton-st. is contemplated at a cost of $1,941. Wm. J. Douglass, twn. clk.

Goshen, Ind.—A resolution was passed Sept. 3 providing for cement walks in Forty-fifth-st. Israel D. Wolf, cy clk.

North Baltimore, O.—Bids will be asked soon for paving four blocks of S. Main-st. with brick. Jay Radebaugh, cy. clk.

Connellsville, Pa.—Ordinances have been passed for block paving and stone curbing in Apple and Main-sts. George B. Brown, clk.

Salt Lake City, Utah—The city engineer has submitted specifications for repairs and resurfacing the asphalt streets.

Camden, N. J.—An ordinance has been passed to repair Second-st., from State to Market, with asphalt. H. C. Kramer, clk. cy. com.

Ft. Wayne, Ind.—Resolutions were adopted Sept. 13 for brick paving on Calhoun-st. and Indiana-ave. A. M. Schmidt, clk. B. P. W.

Cleveland, O.—Preliminary steps have been taken for widening Erie-st. and repaving it with asphalt from Lake-st. to Woodlawn-ave.

New Rochelle, N. Y.—Plans and specifications have been prepared for the proposed North-st. boulevard. The estimated cost is $100,000.

Everett, Wash.—The paving of Hewitt-ave. is contemplated. The question of material has not been considered, but brick is favored by some.

Evansville, Ind.—A resolution was passed to pave portions of St. Joseph-ave. and Franklin-st. with block. George W. Swearminger, clk. B. P. W.

Brazil, Ind.—Plans and specifications were adopted and bids authorized Sept. 18 for paving W. Main-st. in two sections. Mayor Bailey.

Maryville, Mo.—The city council has authorized the paving of Buchanan, Second and Third-sts. with blocks in the residence portion of the town.

Florence, Ala.—The question of good roads is being agitated in this county. An experimental mile will be built by M. V. Eldridge of Washington, D. C.

Cedar Rapids, Ia.—The city council has published notice of intention to pave and curb Fourth-ave., from Twelfth to Division-sts. J. D. Blain, cy. clk.

Rockford, Ill.—The residents of National-

ave. will petition the board of local improvements to macadamize that thoroughfare from Guard to Douglas-st.

Findlay, O.—A resolution was passed Sept. 17 for building a curb and gutter on Franklin-ave., from Defiance-ave. to Howard-st. Frank C. Ray, cy. clk.

Brooklyn, N. Y.—The property-owners on Sumner-ave., from Lafayette-ave. to Fulton-st., are inaugurating a movement to secure granite block pavement on that street.

St. Paul, Minn.—Estimates have been submitted for paving Wabasha-st., from College to University, with brick, granite or sandstone. Cy engr, Sublette.

St. Augustine, Fla.—Appropriations have been made for repairing San Marco-ave. Hypolita, Orange, Cordora, King, Sanford and Cedar-sts. and Cathedral-place.

Stillwater, Minn.—The council is considering the purchase of part of the Carli stone quarry on the north hill, from which stone may be taken for macadamizing streets.

East Cleveland, O.—The county commissioners have been petitioned to improve Rush or Noble road, from Euclid to Mayfield, a distance of three miles, with stone and macadam.

Pemberville, O.—The property-owners in W. Front-st. want the street paved with brick. Macadam paving with brick gutters and curbing will be constructed on Front-st.

Winnipeg, Man.—Broadway from Kennedy to Osborne, will be paved with asphalt, and the west side of Edmonton-st., from Portage-ave. to Cumberland-ave., will be boulevarded. C. J. Brown, cy. clk.

Hartford, Conn.—A resolution has been passed directing the street board when advertising for street asphalt pavement to open competition to all kinds of asphalt and advertise for five and ten years' guarantee.

Kansas City, Kas.—Resolutions have been passed providing for brick paving and stone curbing in James, Twelfth, Tenth, Sixth and Thirteenth-sts. and Waverley and Everett-aves. W. B. Trembley, cy. clk.

Philadelphia, Pa.—William G. Haddock, director department public works, recommended in his last annual report that sheet asphalt as well as all other street pavements be laid on a cement foundation only.

Parsons, Kan.—An ordinance was passed Sept. 10 condemning certain sidewalks and ordering that they be removed and vitrified brick walks be constructed in their place. C. Rockhold, mayor; James Weaver, cy. clk.

New Haven, Conn.—The council voted to accept the majority report of the conference committee on permanent pavements, which favors vitrified brick for Elm and Crown-sts. Chapel-st. will be paved with brick.

Washington, Ill.—The board of local improvement has been authorized to pave Commercial-st. with brick. It is believed that the property-owners in the streets leading from the square will not petition for brick pavement.

Jersey City, N. J.—The street and water board is considering a petition for asphalt paving on Palisades-ave., between Beacon and Laidlaw-aves., in front of Christ hospital.

Jersey City, N. J.—The special committee of the Hudson county freeholders recommends the paving of the Newark turnpike, through Kearney and Harrison, with oblong granite blocks.

Huntington, Ind.—A resolution was passed Sept. 13 providing for stone, cement or brick sidewalks on certain streets. A hearing will be given Oct. 9. Charles H. Cutshall, cy. clk.

Burlington, Io.—A resolution will be considered for passage Oct. 15, for paving Washington-st. from Third to Fourth with brick on a macadam foundation. Resolutions have been adopted for brick paving in Columbia-st. and an alley. Mayor Marquardt.

New York City—The board of estimate and apportionment has authorized, subject to the action of the municipal assembly, a sale of bonds for street paving, as follows: Manhattan and the Bronx, $1,200,000; Brooklyn, $750,000; Queens, $75,000. Richmond, $25,000.

Scranton, Pa.—The Northern boulevard company, an organization of the local capitalists, contemplates the purchase of the Providence & Abington turnpike and plank road company, when they will construct a macadam road from Providence to Clark's summit.

St. Joseph, Mo.—An ordinance was appointed Sept. 15 for brick sidewalks and curbing on Pater-st., from Twenty-fourth to Twenty-eighth. Ordinances have been introduced for asphalt paving on Third and Fourth-sts. John Comb, mayor; John J. Downey, cy. clk.

Boston, Mass.—Paving is contemplated, to be done at once, as follows: Atlantic-ave., from Olive to Commercial-sts., granite block on concrete base, Portland cement grout joints, $92,800; Commercial-st., from Clinton to Prince-sts., same kind of paving, $94,900; Oliver-st., between Atlantic-ave. and Milk-st., granite block, pitch joints, concrete base, $24,000.

Pueblo, Col.—Alex McGregor, who is interested in asphaltum beds 30 miles from Rifil, Col., has made a proposition to the city council, in which he offers to give all the asphaltum necessary to pave Union-ave., from the viaduct to the central block, the city to pay for the mining of it, the freight and expense of laying it.

Butte, Mont.—The Street Railway company has asked the council to pave Wyoming-st. to Copper-st. and to place curbing and catch basins on Copper-st. The company offers, if the work is done, to pave the whole of Copper-st., from Wyoming to Hennessey's stables. The council committee has recommended the paving of a number of streets on which street cars run, the work to be done next year.

CONTRACTS TO BE LET.

Wellston, O.—Bids are asked until Oct. 3 for paving Pennsylvania-ave. T. P. Wrangler, cy. clk.

Youngstown, O.—Bids are asked until Oct. 6 for repairing portions of two streets. C. E. Cross, clk. bd. cy. comrs.

Home City, O.—Sealed bids are asked until Oct. 5 for improving Independence-st. J. O. Falkinburg, clk.

Kingston, N. Y.—Sealed bids are asked until Oct. 5 for asphalt block paving on John-st. John T. Cummings, cy. clk.

Norwalk, O.—Bids are asked until Oct.

16 for building walks on a number of streets. Cy. clk.

Winona, Minn.—Bids are asked until Oct. 8 for paving Lafayette-st.

Akron, O.—Bids are asked until Oct. 13 for improving Wolf-st. Cy. com'rs.

Niles, O.—Bids are asked until Oct. 15 for grading, curbing and paving Robbins-ave. with asphalt block. John J. McDermott, cy. clk.

Arcanum, O.—Sealed bids will be received until Oct. 3 for paving Main, North, First and Second-sts. Duke Mote, engr., Greenville, O.

Greensburg, Ind.—Sealed bids are asked until Oct. 2 for building free gravel roads in Clay township. Coleman F. Pleak, county auditor.

Ashland, Wis.—Bids are asked until Oct. 2 for curbing and slagging Seventh-st. west from Second to Third-st. Chas. Crogster, chm. B. P. W.

South Bend, Ind.—Sealed proposals are asked until Oct. 8 for grading E. Madison-st., from Notre Dame to St. Peter-sts. L. A. Hull, cy. clk.

Chester, Pa.—Bids are asked until Oct. 31 for paving a portion of Broad-st. with asphalt. Jas. R. Bagshaw, chairman, committee on streets.

Des Moines, Ia.—Bids are asked until Oct. 4 for 9,393 sq. yds. of brick paving. G. A. Eberhart, chm. B. P. W.

Cincinnati, O.—Sealed bids are asked until Oct. 19 for paving Mead-ave. with brick. Geo. F. Holmes, clk. B. P. W.

Danville, Ind.—Sealed bids are asked until Oct. 5 for constructing free gravel roads. A. T. Dooley, chairman commissioners; Chas. M. Coviners, co. audt.

Greensburg, Ind.—Sealed bids are asked until until Oct. 19 for building hand pressed block, cement or cut stone sidewalks on Washington and Broadway-sts. M. Brazelton, cy. clk.

Crawfordsville, Ind.—Sealed proposals are invited until Oct. 8 for constructing cement curb and gutter in E. Pike-st., from Green to Water. E. S. Simpson, cy. clk.

Indianapolis, Ind.—Bids are asked until Oct. 13 for grading and graveling Central-ave., from Fall creek bridge to Thirty-fourth-st. John McGregor, chrm. co. com'rs.

Atlantic City, N. J.—Bids are asked for until Nov. 7 for building seven miles of gravel road. John J. Albertson, Engr. Magnolia, N. J.

Delaware, O.—Sealed bids are asked until Oct. 13 for macadamizing, curbing and guttering University-ave. E. E. Naylor, cy. clk.

Springfield, Ill.—Sealed bids are asked for until Oct. 2 for laying cement walks in the yard of the court house. Fred Edmonds, chrm. com.

Waukesha, Wis.—Sealed bids are asked until Oct. 20 for macadamizing, curbing and guttering East and Grand-aves. John P. Dey, chm. B. P. W.

San Francisco, Cal.—Bids are invited until Oct. 4 for clearing, grubbing trees and grading and repairing the roads at National cemetery. Maj. Oscar F. Long, Q. M.

Huntington, Ind.—Sealed bids are asked until Oct. 9 for paving and curbing Court-st. from Jefferson to Warren; curbing, grading and constructing vitrified brick sidewalks on Canfield and Cherry-sts. Frank Gutherie, Cy. C. E.

New York City—Sealed bids are asked until Oct. 4 for asphalt paving in Lafayette-ave., Mark's place, Decatur and Macon-sts., Brooklyn; regulating and grading Ritter-place and 197th-st., Bronx.

Dallas, Tex.—Sealed bids are being asked until Oct. 3 for about 31,000 sq. yds. of asphalt paving on cement base on Elm-st. Hugh Ramis, cy. engr.; I. A. Mure, cy. clk.

New York City—Bids are asked until Oct. 1 for repairing the asphalt on Washington, Macomb's dam and Third-ave. bridges; also separate bids for the sidewalks and the approaches to Third-ave. bridge. John L. Chea, com'r. of bridges.

Middletown, O.—Sealed bids are asked until Oct. 16 for paving Main-st., from First to Third, with asphalt, blocks between the street car tracks, the work consisting of the following: Sheet asphalt, 4,763 sq. yds.; block asphalt, 1,011 sq. yds.; new curbing, 21 ft.; old curbing reset, 332 ft. Frank Stevens, cy. clk.

Salem, O.—Sealed proposals are asked until Oct. 1 for paving Main-st. with vitrified brick with stone curbing. Bids are asked until Oct. 15 for paving First-st., from Main-st. to Franklin-ave.; Franklin-ave., from a point in the western addition to Saltillo Wood; Saltillo Wood, from Franklin-ave. to Perry-st.; Perry-st., from Saltillo Wood to Third-st. Robert F. Wallace, vil. clk.

Decatur, Ind. (Special)—W. E. Fulk, C. E., says bids will be received until Oct. 25 for building macadam roads as follows: Monroe twp., Central macadam road, 6,185 mis., $23,829.10; Pleasant Valley and Oak Grove macadam road, 6.018 mis., $20,861.95; C. E. Bollinger macadam road, 6.050 mis., $19,480.30.

CONTRACTS AWARDED.

Orange, N. J.—Daniel G. O'Rourke secured the contract for improving Park-place for $2,544.

Madison, Wis.—The contract for macadamizing several streets was awarded to L. B. Gilbert.

Peoria, Ill.—The contract for paving S. Adams-st. with brick was awarded to James S. Allen for $13,200.

Mitchell, S. D.—The contract for cement gutters was awarded to Gotlelb Scheurenbrand at 18 cents a sq. ft.

Columbus Grove, O.—The contract for brick paving was awarded to Henry P. Streicher of Toledo for $22,000.

Parkersburg, W. Va.—The contract for paving between the car tracks on Spring-st. was awarded to Colly Skidmore.

Wilkinsburg, Pa.—Ott Bros. & Co. of Pittsburg have been awarded contracts for improving several streets in the borough.

Union Grove, Wis.—The contract for macadamizing the main street was awarded to Alfred M. Williams at 55 cents a sq. ft.

Albany, N. Y.—The contract for paving Livingston-ave. with granite blocks was awarded to Mulderry Bros. for $16,550.

East Newark, N. J.—The contract for paving Third-st. with Belgian block was awarded Sept. 12 to William C. Shanley of Newark.

Newark, N. J.—Paving contracts were awarded Sept. 13 as follows: Metropolitan Asphalt Paving company, one contract,

$2.12½ a sq. yd.; Barber Asphalt Paving company, four contracts, $2.11½ a sq. yd.

Binghamton, N. Y.—The contract for paving the east end of Eldridge-st. with brick was awarded to Sheehan & McGhann.

Atchison, Kas.—M. J. Cloyes secured the contract Sept. 17 for grading, paving and curbing N. Seventh and Mound-sts.

Owensboro, Ky.—The contract for curbing and gutters on Lewis-st. was awarded to the Owensboro Artificial Stone company for $2,257.20.

Buffalo, N. Y.—The contract for paving Broadway with asphalt was awarded Sept. 17 to the American Contracting company for $35,250.

Duluth, Minn.—The Western Creosoting company secured the contract for paving the Sixth-ave. W. viaduct. Tamarac block will be used.

Wauwatosa, Wis.—The contract for grading, graveling, guttering and curbing First-ave. was awarded Sept. 21 to D. T. Pil grim, jr.

Lagrange, Ill.—The contract for paving Chestnut-st. and Grove-ave. was awarded to Contractor Lyon of Lagrange Park.

Marietta, O.—The contract for paving Maple-st. was awarded Sept. 18 to John Wilking of this city at 90 cts. a sq. yd. for Sterling pavers.

Cincinnati, O.—The Trinidad Asphalt Paving company is reported as having received the contract for paving Bruce-ave. with asphalt for $10,109.

Lebanon, Ind.—The contract for building about 1,630 feet of cement walks and curbs on Washington-st. was awarded to Geo. Seibert of Indianapolis.

Somerville, Mass.—(Special.)—John P. Prichard, st. comr., awarded the contract for paving Davis-square with brick to John Turner & Co.

Lawrence, Kas.—J. D. Hanley & Co. was awarded the contract Sept. 4 for paving Louisiana-st., from Winthrop to Pinckney-st., at $1.24 8-10 a sq. yd.

St. Paul, Minn.—D. W. Moore submitted the lowest bid Sept. 17 for curbing and boulevarding Holly-ave. at $4,091.70. Action on the bid was deferred.

Oshkosh, Wis.—The contract for about six blocks of brick paving on Main-st. was awarded to A. E. Rutledge of Rockford, Ill., for about $7,000.

Wilmington, Del.—The contract for laying a cement sidewalk on Park-place, along Cool Spring Park, was awarded Sept. 11 to Robert McCauley at $1.24 a sq. yd.

Westerly, R. I.—The Rhode Island Granite works, of this city, secured the contract Sept. 18 for furnishing 6,170 sq. yds. of granite paving blocks at $1.05.

Norfolk, Va.—The contract for paving Claiborne, Reservoir, Willoughby and Windsor-aves., in Brambleton, was awarded to the Southern Paving & Construction company.

Warrensburg, Mo.—The contract for paving Holden road and Pine-sts. with vitrified brick was awarded to Joseph Pope & Bro. of Jefferson City, Mo. at $1.52 a sq. yd.

Boston, Mass.—Paving contracts have been awarded as follows: Tremont-st., 10,000 sq. ft., Barber Asphalt company, $35,000; Beacon-st., 10,000 sq. ft., Barber Asphalt company, $32,500.

Fond du Lac, Wis.—L. Schoenlaub was awarded the contract Sept. 4 for paving W. Division-st. with brick for $11,000. Purington repress brick with sand filler will be used.

Scottsboro, Ala.—The contract for building 21 mls. of road was awarded Sept. 10 to Contractor Dutton of Somerville, Ga., and Dr. McClendon of Hollywood at $900 per mile.

Wabash, Ind.—The contract for laying 71,140 sq. ft. of cement walks on Hill-st. was awarded Aug. 27 to C. M. Kirkpatrick of Greenfield, Ind., at 84 cts. a lin. ft.; total, $16,244.

Springfield, Mass.—Bids were received Sept. 4 for paving parts of Bridge, Court and Sanford-sts., as follows: Central Asphalt company, Hartford, Conn., $2.86 a sq. yd.; Boston Asphalt company, $3.01.

Rochester, N. Y.—H. N. Cowles was awarded the contract for paving Birr-st. with trap rock for $16,232. The contract for paving Ontario-st. with brick was awarded to Lauer & Hagaman for $13,773.

Toledo, O.—Paving contracts have been awarded as follows: C. W. Ryan, Ewing-st., Harris pavers, $5,202; Page-st., Harris pavers, $7,582, and Buckeye block, $1,524; Locust-st., Buckeye block, $7,425.

Pittsburg, Pa.—Contracts for paving eight streets with asphalt, involving an expenditure of $70,000 are reported as having been awarded to the Pennsylvania Asphalt company and the Pittsburg Asphalt Paving company.

St. Louis, Mo.—F. D. Martin submitted the lowest bid Sept. 18 for paving Union boulevard with brick at $15 per sq. ft. The H. Ruecking company bid $25.90 per sq. ft. for reconstructing Jefferson-ave. with granitoid.

Gas City, Ind.—Contracts for constructing cement and brick sidewalks have been awarded as follows: Cement, portions of eleven streets, Wm. Minnick, 10¾ cts. a sq. ft.; brick, two streets, A. Eakins, 9½ cts. a sq. ft.

Wheeling, W. Va.—The contract for paving First-st., from Hanover to Jefferson, was awarded Sept. 15 to H. T. Day of Bellaire, O., as follows: Excavating, 8 cts. a cu. yd.; filling, 18 cts.; laying brick, 15 cts. a sq. yd.

Indianapolis, Ind.—The contract for paving Highland-place, from Twenty-first-st. to Highland-place addition, with creosoted wooden blocks, with curbing, was awarded, Sept. 5, to the Hoosier Construction company at $5.88 a lin. ft.

Janesville, Wis.—(Special)—The contract for brick and macadam paving, with curbing and gutters, on Court, Clark, Dodge and Pleasant-sts., was awarded, Aug. 30, to John Martin of Oshkosh for $15,450. C. V. Kerch, cy, engr.

East Orange, N. J.—Wright & Lindley of Orange were awarded the contract, Sept. 17, for paving and macadamizing Rutledge and Linwood-ave., but refused to do the work because the council will not give them the contract for macadamizing and curbing Ninth-ave., although they were the lowest bidders.

Schenectady, N. Y.—Kellam & Shaffer secured the contract for paving Church-st., from Front to Erie canal, as follows: Excavation, 15 cts.; brick paving, $1.94; asphalt, $1.94; curbing, 68 cts.; water connections, 5

cts.; sewer connections, 60 cts.; water tables, $8; total, $18,651.

Muscatine, Ia.—Fuller Bros. secured the contract, Sept. 4, for brick paving in Dist. No. 17, as follows: 4,655 cu. yds. exc., 20½ cts.; 13,161 sq. yds. brick paving, 95½ cts.; 5,440 ft. curb and gutter, 47½ cts.; 2,400 ft. alley curb, 23½ cts.; total, $16,671.03.

Sacramento, Cal.—Bids for grading and macadamizing the Riverside road were received as follows: Jas. A. McMahon, $4,280; W. G. Schmidt, $6,850, with $2.90 per cu. yd. for extra rock; Jas. Touhey, grading road, $950, with 2.79 yds. of rock at $2.50.

Omaha, Neb.—Bids were received for paving Twenty-fourth and Dodge-sts., Sept. 7, as follows: Barber Asphalt Paving company, asphalt, $1.93 a sq. yd., 5-yr. guaranty, and $2.17 on 10-yr. guaranty; W. P. Mumaugh, brick, $1.21 and $1.80 a sq. yd. C. D. Woodworth bid 62 cts. a lin. ft. on Berea and Bedford stone curbing, and 68 cts. on Lyon stone curbing.

Altoona, Pa.—(Special)—Harvey Linton, cy. engr., says that the contract for repaving Eleventh-ave., between Eleventh and Fifteenth-sts., was awarded, Sept. 5, to the Alcatraz Paving company of Pennsylvania, 1023 Witherspoon Bldg., Philadelphia. The pavement is to be 1½ ins. of asphalt on 6-in. concrete foundation, with a 5-yr. guaranty of maintenance at contractor's expense.

Toronto, Ont.—Paving contracts were awarded recently as follows: Dowling-ave., asphalt, Construction and Paving company, $12,600; Huron-st., asphalt, Warren-Scharf Asphalt Paving company, $9,500; Shaw-st., cedar block, Dominion Paving and Constructing company, $2,500; Maple-ave., macadam, Warren-Scharf Asphalt Paving company, $2,573; Sully-st., Constructing and Paving company, $4,068; Scoria track allowance, York-st., Dominion Paving and Contracting company, $8,069.

Indianapolis, Ind.—Contracts for paving have been awarded as follows: New Jersey-st., from South to Merrill, asphalt, Warren-Scharf Asphalt company, $6.13 a lin. ft.; an alley, brick, Capitol Paving and Construction company, $1.02; cement walks, curbs and gutters, Walcott-st., E. W. Seamons, 55 cts. a lin. ft.; cement walk, College-ave., J. D. Hoss, 67 cents.; Wabash-st., brick with cement walks, W. C. Allen, $3 a lin. ft.; cement walks, Massachusetts-ave., Julius Keller, $1.71.

Dayton, O.—Bids were submitted, Sept. 17, for 5,650 sq. yds. of brick or block paving on Richard-st., with 10-yr. guaranty, as follows: David Beard, Dayton, 21-in. straight curbing, 55 cts.; 21-inch circular curbing, $1; protection curbing, 40 cts.; Wassal block, $1.63 per sq. yd.; repairing pavement, $3.50 per sq. yd. E. Brentlinger, Dayton, 21-in. straight curbing, 50 cts.; 21-in. circular curbing, 90 cts.; protection curbing, 30 cts.; Athens block, $1.63 per sq. yd.; Wassal block, $1.61; Logan block, $1.59; repairing paving, $3.50 per sq. yd.

Buffalo, N. Y.—Paving contracts were awarded, Sept. 4, as follows: Barber Asphalt company, repaving Wells-st., asphalt, $4,231; repaving Orton-place, asphalt, $3,546; repaving Vine-st., asphalt, $1,171. Henry P. Burgard, repaving Anderson-place, asphalt, $3,000; repaving Ellicott-st., asphalt, $8,296; repaving Walden-ave., asphalt, $38,000. German Rock Asphalt and Cement company, repaving Massachusetts-ave., asphalt, $36,071. Miller & Franklin, macadamizing Crescent-ave., $3,300. The German Rock Asphalt and Cement company was awarded the contract, Sept. 17, for repaving and widening Main-st.

San Antonio, Tex.—(Special)—E. G. Trueheart says the contract for paving the streets with natural rock asphalt was awarded, Sept. 10, to the Parker-Washington company of Kansas City, Mo., as follows: exc., 37,272.6 sq. yds., 36 cts.; concrete, 16,789 cu. yds., $4.40; asphalt, 100,731.6 cu yds., $1.14; straight curb, 60,116 lin. ft., 56 cts.; round corners, 1,240 lin. ft., $1.19; headers, 40,806 lin. ft., 50 cts.; total, $239,703.32. The other bidders for the work were: Louisiana Imp. company, New Orleans, La.; Barber Asphalt Paving Co., New York City; Southern Asphalt paving company, New Orleans, La.; Uvalde Asphalt company, Cline, Tex.; J. P. Nelson, San Antonio, Tex.; Texas Asphalt company, San Antonio; T. H. Micklejohn & Co., San Antonio; J. R. Lambert & T. W. Newton, San Antonio; David Lehr, San Antonio.

SEWERS.

Bristol, Va.—While engaged in building a sewerage system in this city an opening was discovered on Moore-st. which to all appeareances was the opening of a large cavern, and rocks thrown into it cannot be heard to strike the bottom.

Newark, N. J.—The board of street and water commissioners passed ordinances Sept. 20 providing for four pipe sewers which were laid a year ago without authority. The board sought to legalize the illegal action, but it is feared that complications may yet ensue.

CONTEMPLATED WORK.

Slayton, Minn.—A sewer on Broadway is proposed.

Lake Linden, Mich.—A sewerage system is proposed.

Hartford, Conn.—A sewer on Wadsworth-st. is proposed.

Midland, Ont.—Plans are being prepared for a sewerage system.

Morgantown, W. Va.—A sewerage system for South Park is proposed.

New Orleans, La.—Bids for sewer bonds will be opened in December.

Guthrie, O. T.—The city council has accepted the plans for a sewerage system.

Rochester, N. H.—The council has appropriated $3,000 for building new sewers.

Gainesville, Fla.—The construction of a sewerage system is contemplated.

Birmingham, O.—A sewer in Whitemore-st. and one in an alley is contemplated.

Red Oak Junction, Ia.—The construction of sewers on several streets is proposed.

Cedar Rapids, Ia.—The extension of the Vinton ditch storm water sewer is contemplated.

Delaware, O.—The question of building a new sewerage system will be voted on in November.

Madisonville, O.—The question of building a new sewerage system is again being discussed.

Rome, N. Y.—Plans and specifications have been submitted for the extension of

the sewerage system on Gas alley, Naple, Jane and Garden-sts. and Floyd-ave. Mayor White.

Findlay, O.—Ordinances have been passed to build sewers in Front, Tiffin and South-sts.

Washington, La.—A resolution has been adopted to establish a twelve mile sewer on E. Main-st.

Lawrence, Mass.—The board of aldermen will borrow $25,000 for completing the Shanty pond sewer.

Rockville, Conn.—An appropriation of $3,000 for a storm water sewer in McLean-st. is proposed.

Ogden, Utah—The construction of a sewer in district No. 9 is contemplated. John V. Bluth, cy. rec.

Merchantville, N. J.—Plans for the proposed sewer have been approved by the state sewerage commission.

Terre Haute, Ind.—Plans have been approved for a sewer on College-ave., from Fourteenth to Fifteenth-sts.

New Decatur, Ala.—Street and sewer bonds to the amount of $45,000 will be issued. F. C. Payne, mayor.

Rat Portage, Ont.—The construction of sewers on several streets, at a cost of about $3,750, is contemplated.

Haddonfield, N. J.—The city council decided Sept. 14 to give the filtration system of sewerage disposal a trial.

Ogden, Utah—The estimated cost of building seven blocks of sewer in Twenty-first and Twenty-second sts. is $15,682.

Kansas City, Mo.—Plans have been ordered prepared for a sewerage system for the eastern and southern part of this city.

Montreal, Canada—The construction of sewers in Drummond and Huntley-sts. is proposed. Percival W. St. George, cy. sur.

Newton, Ia.—An ordinance providing for the reconstruction of sewers has been passed. Frank A. Long, mayor; A. Gates, cy. clk.

Paterson, N. J.—An ordinance is pending which provides for building sewers in Sussex, E. Twenty-ninth, River and N. Tenth-sts.

Bangor, Pa.—A proposition to build a sewerage system has been made by E. B. Byington of the Sanitary sewerage company of Philadelphia.

Wakefield, Mass.—A system to connect with the North Metropolitan sewerage system is proposed. Orlando K. Morgan, township engineer.

Jackson, O.—Plans for a complete system of sewers with sewerage disposal plant will be prepared by Riggs & Sherman, engrs., Toledo, O.

Cleveland, O.—The question of building a 10 in. main sewer in the new boulevard, and a 6 in. main in Lakewood-ave. is being contemplated.

Villisca, Cal.—Councilmen Andrew, Pulver and Minick have been appointed a committee to ascertain the cost of a sewerage system.

Kalamazoo, Mich.—George S. Pierson, C. E., has submitted a report on the proposed sewerage system for the southern portion of this city.

Marshalltown, Ia.—Surveys are being made for the sewage disposal plant, and stakes will be set at once for the twelve filter beds proposed.

Lima, O.—Ordinances are pending for sewers in N. Elizabeth, S. Union, N. Main, Bellefontaine and Oak-sts., and Holmes and Hughes-aves.

Davenport, Ia.—The city engineer has been instructed to prepare a plan and estimate for the building of a main sewer in district No. 1. Mayor Heinz.

Newport, Ky.—A resolution has been passed to lay about 15,000 ft. of 8 to 30 in. sewers and some 3 in. brick drains. W. L. Glazier, supt. pub. wks.

Ben Avon, Pa.—Ordinances were approved Sept. 11th for building sewers and outlets in Laurel, Monitor and Watt-aves. Henry W. Armstrong, burgess.

Toledo, O.—Plans are being approved by the sewer committee for building a district sewer to drain the district between Birmingham and Ironville.

Moorestown, N. J.—Plans and specifications for methods of sewage disposal will be received by Dr. Joseph Stokes, chairman township commissioners.

Mackinac, Mich.—The council desires to receive proposals from responsible parties for constructing and maintaining sewerage and water works systems.

Madison, N. J.—Councilman Brown and Burnet have been appointed a committee to confer with the board of health regarding a sewage disposal plant for this borough.

South Omaha, Neb.—Councilmen Clifton, Johnson and Trainor have been appointed a committee to investigate the condition of Mud Creek and the need of a sewer.

Tekonsha, Mich.—Plans for a surface water sewerage system are being prepared by Pratt Cortright, county surveyor. The sewer will involve the building of 3,000 ft. of main sewer and 6,000 feet of laterals.

Iron Mountain, Mich.—A resolution has been adopted providing for the construction of an 8 in. lateral or branch sewer in special sewer district No. 3 of main sewer district No. 2. Jas. D. Cudlip, cy clk.

Birmingham, Ala.—A main county sewerage system is proposed, with which the various growing towns can connect, assuring the carrying of sewerage beyond the limits of the thickly settled portions of the county. S. W. Slayton, secy. Birmingham Real Estate Association.

Deadwood, S. D. (Special)—D. A. McPherson, president of the council, says that this city desires the services of an able engineer to pass upon the sanitary effect of sewerage which it is proposed to run through the heart of the town from Lead, which is about three mls. distant.

Newark, N. J.—An ordinance is being published for the construction and maintenance of the proposed joint outlet or trunk sewer, with branches and appurtenances for Newark, Summit, Millburn, Irvington, East Orange and South Orange. Geo. M. Ballard, prest. bd. str. and water com'rs.; Wm. E. Greathead, clk. bd.

Columbus, O.—The sewer commission will soon submit to a vote of the people a proposition authorizing a bond issue of $1,000,000 for immediate use in the construction of new sewers, the repair of the old ones, and for the construction of an experimental purification or sewage disposal plant. Plans have been prepared for main trunk sewers in Sullivan hill.

CONTRACTS TO BE LET.

New York City.—Bids are asked until Oct.

3 for sewers in E. One Hundred and Forty fourth-st. and Walton-ave. Bronx. Dept. sewers.

Winona, Minn.—Bids are asked until Oct. 8 for building a storm sewer.

Youngstown, O.—Bids are asked until Oct. 6 for building a sewer in Mulberry-st. C. E. Cross, clk. bd. cy. comrs.

Elkhart, Ind.—Sealed bids are asked until Oct. 8 for sewers on Franklin and Bower-sts. L. E. Hitchcock, cy. C. E.

Springfield, O.—Sealed bids are asked until Oct. 4 for building sewers in certain streets. R. N. Lantz, cy. clk.

Hamilton, O.—Sealed bids are asked until Oct. 4 for building a stone sewer on High-st. M. O. Burns, cy. clk.

Bowling Green, O.—Sealed bids are asked until Oct. 17 for the extension of main and trunk sewers. J. E. Shatzel, mayor.

Salem, O.—Sealed bids are asked until Oct. 8 for building sewers in East, Sixth and Columbia-sts. Geo. Holmes, cy. clk.

St. Louis, Mo.—Bids will be received until Oct. 9th for building sewers in Rock Springs district No. 9. Sewer Commis. Hermann.

Seymour, Ind.—John D. Durment, county auditor, will sell to the lowest bidder, at public auction, Oct. 13th, the contract for a ditch.

Cincinnati, O.—Bids are asked until Oct. 6th for constructing a culvert in Bloody River Creek in Milbank township. E. L. Lewis, co. audt.

Harrisburg, Pa.—Bids are asked until Oct. 1st for an 18-inch pipe sewer in Sixth and Schuylkill-sts. Geo. B. Stucker, highway comrs.

Evansville, Ind.—Sealed bids are asked until Oct. 13th for building a sewer in Delaware-st., and an alley. Geo. W. Swearinger, clk. B. P. W.

Huntington, Ind.—Sealed bids are asked until Oct. 9th for building a ten-mile pipe sewer in Canfield-st., with manholes, inlets, house drains, etc. Frank Guthrie, cy. C. E.

Napoleon, O.—Sealed bids are asked until Oct. 6th for building 3,068 lineal feet of 15, 12, 10-in. vitrified pipe sewers. Usher Fisher, vil. clk.; C. N. Schwab, engr.

Sacramento, Cal.—Sealed bids are asked until Oct. 6th for installing a sewage pumping plant for the Folsom prison. Brainard F. Smith, clk. state bd. prison directors, Sacramento.

Arcola, Ill.—Bids are asked until Oct. 4th for the construction of a drainage ditch, to include about 1,800 feet of 30-in., 2,100 feet 18-in., 2,100 feet 16-in., 2,075 feet 15-in, and 1,085 feet 14-in. tile. John Harrington, James H. Davidson, Peter Welsch, drainage coms.

Florence, Colo.—Sealed bids are asked until Oct. 15th for building a system of sewers, consisting of the following: 27,210 lin. ft. 8 to 12-in. sewer pipe, 4,900 ft. 15 to 24-in. pipe, 40,000 cu. yds. excavation, twenty 5-in. flush tanks, fifty man-holes, fourteen lamp-holes. E. B. Ruddick, cy. clk., A. B. McFall, cy. engr.

Saratoga Springs, N. Y.—(Special)—Sealed bids are asked until Oct. 2 for building 23,000 ft. of stone water conduits, to remove water now discharging into the sewers. This work is preparatory to the construction of a sewage disposal plant. The contract for furnishing 23,000 ft. of vitrified pipe of dimensions varying from 12 to 30 in. in diameter was let to the New York State Sewer Pipe company, Sept. 21. The plans and specifications for the water carriers were prepared by J. S. Mott & Son. H. F. Thomas, clk. sewer and water commis.

CONTRACTS AWARDED.

Albany, N. Y.—Dollard & Holler secured the contract for a sewer on Bassett-st.

Kearney, N. J.—F. W. Mackie was awarded the contract for a sewer in Kearney-ave.

Providence, R. I.—F. E. Shaw secured the contract for a section of sewer on Admiral-st.

Hudson, Wis.—The contract for building a sewerage system was awarder to Peter Kirchner.

Merrill, Wis.—The contract for a sewer in Poplar-st. was awarded to the Merrill Plumbing and Heating company.

Flint, Mich.—E. W. Reed secured the contract for building the Detroit-st. sewer at 88 cts. per lin. ft.

Fishkill Landing, N. Y.—The contract for a new storm sewer was awarded to Wm. H. Peattle for $2,026.

Bangor, Me.—The contract for building a sewer in Wilson-st. has been awarded to S. H. Woodbury & Co.

Cleveland, O.—W. C. Gayer & Co. secured the contract for building the Walworth run sewer for $126,638.

Watertown, S. D.—The contract for building a sewerage system was awarded to Hess & Row of this city for $13,649.

Buffalo, N. Y.—Jacob Ritzmann submitted the lowest bid Sept. 17 for a sewer in Edison-ave. at $1,725.

Seattle, Wash.—The contract for building a sewer in Stewart-st. was awarded Sept. 23 to Sterrat & Goetz for $2,015.

Benton Harbor, Mich.—James Healey of Chicago was awarded the contract for building the east trunk sewer for $3,950.

St. Paul, Minn.—Christ Johnson was the lowest bidder Sept. 17 for a sewer in Rice-st. at $2,980.79. Action was deferred.

Roxbury, Mass.—H. P. Nawn secured the contract for building the section of the high level sewerage system for $129,965.

Milwaukee, Wis.—George E. Zimmerman was awarded the contract for the first section of the new intercepting sewer at $8.90 a ft.

St. Joseph, Mo.—Patrick Morley was awarded a contract Sept. 11 for building a portion of the Blacksnake sewer for $5,000.

Clarinda, Ia.—The contract for a new sewer on the west side of the square has been awarded to the Tallant Hardware company.

Red Jacket, Mich.—The contract for the extension of the sewerage system on Pine-st. was awarded to Charles Mugford for $1,675.

Luverne, Minn.—The contract for the main outlet of the sewerage system was awarded to A. L. Jones and Joseph Kehoe of Canton, S. D., for $4,649.

Toledo, O.—C. W. McKinnery was awarded the contract Sept. 13 for sewers as follows: Alley behind Front and Genesee-sts., $4,841.75; Whittmore-st., $7,028.35.

Chelsea, Mass.—The contract for building sections 56 and 57 of the Metropolitan

sewer system in this city was awarded to H. A. Hanson & Co. for $31,917.

Bayonne, N. J.—The contract for building a sewer at Avenue A and W. Thirty-first-st. was awarded Sept. 19 to Wm. C. Ryan of Jersey City for $1,490.10.

Allegheny, Pa.—John Schlipp secured contracts Sept. 16 as follows: Main sewer in Milroy-ave., $2,535; lateral sewers, Bothwell-ave., $1,079, and Tioga-st., $523.

Des Moines, Ia.—The contract for the brick overflow sewer on Sixth-ave., from High-st. to Bird's run, was awarded Sept. 15 to the Likes Improvement company at $4.90 a lin. ft.

Depew, N. Y.—The contract for constructing a sewage disposal plant was awarded to E. M. Taylor of this city and for constructing sewers to Wm. A. Rappich of Buffalo.

Lead, S. D.—The contract for building the sewerage system has been awarded to J. McDonald of Minn. for $57,000. Andrew Rosewater of Omaha, Neb., will superintend the construction.

Mansfield, O.—The Reugh Construction company of Cleveland secured contracts Sept. 12 as follows: Intercepting sewer, $4,142.80; siphon and force main, $974.50; reservoir and foundation, $15,842.

Buffalo, N. Y.—The Buffalo Dredging company was awarded the contract for filling the bed of the canal and laying a huge sewer to dispose of the filth now emptying into the canal, for $449,000.

New Orleans, La.—The contract for sedimentation tanks was awarded Sept. 12 to Ferd Lange, as follows: Sedimentation tanks, $3,944; pump platform rooms, $105; cribbing under tanks, $169; trestling for elevating tanks, $155; total, $4,373.

Jersey City, N. J.—The contract for a relief sewer in Ocean-ave. was awarded to George Keiss of this city as follows: 375 lin. ft. 42-in. circular brick sewer, $3.75 a lin. ft.; one receiving basin, $85; 100 cu. yds. exc., $2.50 a cu. yd.

Neenah, Wis.—J. Rasmusen & Son of Oshkosh, Wis., were awarded the contract for 800 ft. of sewer extension of Sherry and Ann-sts. as follows: Ann-st., 15-inch, 68c; catch basin connections, 9-inch, 40c; house connections, 6-inch, 70c; manholes, $17 each; catch basins, $25 each. Sherry-st., 15-inch, 69c; catch basin con., 9-inch, 40c; house con., 6-inch, 80c; manholes, $24 each; catch basins, $25 each.

Holland, Mich.—The contract for the construction of a trunk sewer on Central-ave. and Twelfth-st. was awarded, Sept. 3, to S. A. Morman & Co. of Grand Rapids, Mich., for $9,867.82. The contract for the bacteria tanks was awarded to Bos & Bosthius at $657 for the Twelfth-st. and $1,287 for the Central-ave. tank.

WATER-WORKS.

Nanaimo, B. C.—This city voted Sept. 15 to purchase the water works.

Mexia, Tex.—This city voted to purchase the water works, and a new water supply will be developed.

Indianapolis, Ind.—A new water contract with the Indianapolis Water company is being outlined by this city, which agrees to use 1,727 fire hydrants at $42.50 a year, providing the water company will supply water gratis for the park bath house, market and hospital.

CONTRACTS TO BE LET.

Leipsic, O.—Bids are asked until Oct. 16 for building water works. G. L. McKibben, engr., Van Wert.

Zanesville, O.—Sealed bids are asked until Oct. 11 for a mechanical filtration plant. C. H. Bainter, cy. clk.

Piedmont, W. Va.—Bids are asked until Oct. 10 for a gravity main and for a pumping station. W. S. Smallwood, chrm. water board.

Yonkers, N. Y.—Bids are asked until Oct. 9 for furnishing 600 lengths of 4-6-8-in. cast iron water pipe. A. W. Kingsbury, clk. bd. water comrs.

Washington, D. C.—Bids are asked until Oct. 3 for furnishing 60,000 lin. ft. 6-in. cast iron water pipe. H. B. F. McFarland, chrmn. dist. comrs.

Marquette, Mich.—Sealed bids are asked until Oct. 8 for laying an intake pipe for the city pumping station. John P. Kern, secy. bd. fire and water comrs.

Hoboken, N. J.—Bids are asked until Oct. 2 for about 40 tons 6 and 12-inch water pipe, six 12-in. branches, five 6-in. fire hydrants and six 12-in. valves. Henry Lohmann, water registrar.

Pottawatomie, Kas.—Bids will be received until Oct. 17 for a water system for the Kickapoo boarding school. W. A. Jones, comr. Indian affairs, Washington, D. C.

New York City—Sealed bids are asked until Oct. 4 for furnishing cast iron water pipes, branch pipes, special castings, stop cocks and hydrants for Brooklyn; for stop cocks, hydrants, cast iron stop cock boxes and covers, and manhole heads and covers for Manhattan and Bronx. Dept. water sup.

Cincinnati, O.—Sealed bids are asked until Oct. 2 for constructing a tunnel extension and shafts for supplying water to the western pumping station. Bids are asked until Oct. 16 for four self-contained vertical triple-expansion crank and fly wheel pumping engines, of 30,000,000 gals. each. Aug. Herrmann, prest. bd. trustees, water comrs.

Westminster, Md.—Bids are asked until Oct. 1 for furnishing 225 tons of 8 and 10-in. cast iron pipe, 2,000 lbs. special castings, 4,300 ft. 8-in. No. 16 and 18 B. W. G. spiral riveted wrought iron pipe, 4,700 ft. 10-in. No. 16 B. W. G. spiral riveted wrought iron pipe, and 750 lbs. flanged specials. Joseph B. Boyle, secy. Citizens' water and power company.

CONTRACTS AWARDED.

Greene, Ia.—C. H. Ade of Waterloo, Wis., secured the contract for a water system for $10,000.

Detroit, Mich.—The contract for two new pumping engines was awarded, Sept. 19, to E. P. Allis & Co. for $276,000.

Lancaster, N. Y.—The contract for the water works system was awarded to R. B. Lewis of Herkimer, N. Y., for $38,000.

Two Rivers, Wis.—The contract for building the water works was awarded to J. C. Miller & Co. of Chicago for $60,000.

Luray, Va.—The contract for constructing water works was awarded to E. A. Wilson of Salisbury, N. C., for $11,155.96.

Iola, Kas.—The contract for building

water works was awarded, Sept. 13, to W. W. Cook of Junction City, Kas., for $58,473.15.

Barberton, O.—A contract was awarded to Shannon & Co. of Orrville, O., for improvements to the water works for $9.732.

Milledgeville, Ill.—The B. F. Sheets company of Oregon, Ill., was awarded the contract for laying mains for the new water works.

Plymouth, Wis.—The contract for a water works and electric light system was awarded to W. H. Wheeler of Chicago for $69,925.

Grand Rapids, Mich.—Bids were received, Sept. 21, for the Lake Michigan water supply. David Fitzgerald offered to furnish the city with water for $32 per 1,000,000 gals. for a minimum of 20,000,000 gals. a day. J. M. Jackson asked $33 per 1,000,000 gals. for not less than 20,000,000 gals. a day; $26 when the excess reached 3,000,000 gallons or more.

CONTEMPLATED WORK.

Spokane, Wash.—Bids will probably be asked in December for a standpipe.

Whitehall, Wis.—Plans are being prepared for extending the water works.

Williamsburg, Mass.—The question of building a new storage reservoir is being considered by F. A. Brooks.

Ottumwa, Ia.—Plans for a new municipal water works will be prepared by Hiram Phillips, C. E. of St. Louis.

St. Charles, Mich.—Preliminary plans for a water works system have been prepared. John Lafferty, Cy. Clk.

Armour, S. D.—This city voted to issue $3,000 bonds for extending the water main and sinking an artesian well.

Menominee, Mich.—The water committee has recommended a filtration plant as a means of purifying the water supply.

Milddletown, N. Y.—The question of raising $180,000 for increasing the city water supply will be voted on Oct. 3.

Monroeville, Ind.—Bids will be asked for building a water and light plant. G. L. McKibben, Engr., Van Wert, O.

Mackinac, Mich.—The council desires proposals from responsible parties for building and maintaining a water supply system.

Salem, Mass.—An appropriation of $10,000 for replacing cement lined water pipes with cast iron pipes is proposed.

San Diego, Cal.—The question of issuing $600,000 for the acquisition of a municipal distributing system will be voted on.

Haywards, Cal.—Municipal ownership of water works is proposed, either by purchasing the previous plant, or building a new system.

Woodstock, Va.—P. S. Roller, cy. engr., desires quotations on wrought and cast iron pipe. Address him at Mt. Jackson, Va.

Moline, Ill.—Bids will be asked for a high duty pump of 5,000,000 gallons a day and a mechanical filter plant of 4,000,000 gallons a day.

Philadelphia, Pa.—Bids will be asked soon for the proposed 6,000,000 gallon filtration beds. Wm. C. Haddock, dir. bd. pub. works.

Reading, Pa.—The filtration of the water supply from Antietam reservoir is recommended by the water board com'rs. Felix, Heller and Fry.

Carthage, N. Y.—A resolution has been introduced recommending the installation of an auxiliary steam pumping plant, at an estimated cost of $6,000.

St. Louis, Mo.—The board of public improvements will probably consider the question of securing a method to procure a pure water supply when it reconvenes Oct. 9th.

The question of issuing water works bonds will be voted on at the following places: High Point, N. C., Oct. 9th; Radcliffe, Ia.; Ft. Hopkinson, Wis., Oct. 2d.

Laurel, Ind.—A new plan has been decided upon by the town board for the proposed water works system. The new plan is to substitute artesian wells for the spring and place the standpipe in the western part of town. Edward Phelps, mgr.

Randolph, Md., (special)—Plans and specifications are being prepared for a pumping station with a double acting triplex power pump, one centrifugal pump, and one gasoline engine. Bids will be asked soon. Arnold C. Koenig, Grand Island, Neb., engr. H. S. Fisher, cy. clk.

Washington, D. C.—The recommendation of Gen. Wilson to purchase land near Howard University reservoir as a site for the water filtration works, was approved Sept. 13 by Acting Secretary Meiklejohn. Congress had already appropriated $200,000 for land and works.

Dallas, Tex.—In a report submitted Sept. 10 the trade commissioners recommended an increase of storage capacity, laying an additional main and the employment of an engineer to recommend location to storage reservoir.

The construction of water works systems is contemplated at the following places: Lake Linden, Mich.; Jamestown, N. D.; North Augusta, Ga.; Centreville, Ia.; Sullivan, Ind.; Abingdon, Ill.; Marseilles, Ill.; Swedesboro, Pa.; Waverley, Pa.; Dassel, Minn.; Jennings, Ia.; Merchantville, N. J.; Sheffield, Tenn.; Ryan, Ia.; Cayuga, Ont.

Grinnell, Ia.—(Special)—J. F. Wilson, cy. clk., says this city has decided to build an earth dam nine feet high and 300 ft. long to impound surface water for use in boilers and street sprinkling. This will necessitate 4,000 ft. of water mains and transmission of power, either compressed air or electricity, for pumping about 15,000 gals. daily. The city desires to employ an engineer to submit plans for their approval.

BRIDGES.

Adrian, Mich.—The city council has decided to rebuild the bridge at Maumee-st.

Jesup, Ia.—A petition is being circulated for a steel bridge across Forrester's creek, on E. Main-st.

Cedar Falls, Ia.—A resolution was passed Sept. 10 for a new bridge across Cedar river. Bd. supvrs.

Wellington, Kas.—Sealed bids are asked until Oct. 3 for a steel bridge over Slate creek. W. E. Wood, co. clk.

Hailey, Idaho.—Bids are asked until Oct. 20 for a bridge over Little Wood river. W. E. Heard, clk. co. comrs.

Goshen, Ind.—Sealed bids are asked until Oct. 31 for a bridge across Yellow creek, in Concord twp. Peter D. Berkey, co .audt.

Frankfort, Ind.—Sealed bids are asked until Oct. 20 for building a joint bridge

across Middle Fork creek, between Clinton and Carroll counties. Charles C. Huffine, engr. and supt.

What Cheer, Ia.—An iron bridge will be built across N. Skunk river. Bd. suprs.

Newport, Ind.—Sealed bids are asked until Oct. 3 for building two bridges. Wm. P. Ellb. co. audt.

Ft. Scott, Kas.—Sealed bids are asked until Oct. 3 for the stone work for a bridge across Moore's branch, and for a stone culvert across Cedar Hollow. Lydia Barton, co. clk.

Dayton, O.—Sealed bids are asked until Oct. 20 for a bridge across Wolf creek, on McKinley-ave., in Brookville, and for a hoist bridge across the Miami and Erie canal. A. G. Feight, co. audt.

Corbram, N. S. W.—Bids are asked until Oct. 29 for a steel lift bridge over the River Murray. Plans, etc., may be secured from principal assistant engineer for roads and bridges, Sydney, or dept. pub. wks., Melbourne.

Rockville, Ind.—Bids are asked until Oct. 3 for building the approach to the Sugar Mill creek bridge in Sugar Creek twp.; for a bridge on iron legs in Liberty twp.; a 60-ft. steel or wood bridge in Washington twp. S. A. Pike, co. audt.

Boise, Idaho—In a decision rendered by Judge Stewart, Sept. 15, he finds that the contract entered into by the county commissioners with the Gillette-Herzog Mfg. company, for the construction of a steel bridge across the Boise river, near the head of Government Island, is illegal and void, because the board contracted for the expenditure of the sum in excess of the amount authorized by the people.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Spokane, Wash.—A garbage crematory is proposed.

Sewickley, Pa.—A better method of garbage disposal is proposed.

Richmond, Va.—The question of street cleaning is being considered.

Covington, Ind.—The contract for street cleaning was awarded, Sept. 3, to Sam Simms, at $37.50 per month.

Harrison, N. J.—The contract for the scavenger service for one year was awarded to Antonio Saporito, for $110.

South Orange, N. J.—The contract for scavenger service was awarded to Kernan & Bogli of South Orange, for $1,368.

Atlantic City, N. J.—The council has appropriated $16,000 for six new street sprinkling carts, twelve new garbarge wagons, etc. Councilman Leeds, chrmn. sanitary com.

STREET LIGHTING.

Windber, Pa.—An electric light plant is contemplated.

Harlem, Ill.—Bids are desired for an electric light plant.

Mendon, Ill.—This town voted to build an electric light plant.

Wyandotte, Mich.—An electric light plant is contemplated.

St. Joseph, Mich.—This city contemplates building a municipal electric lighting plant.

Kenton, O.—The contract for lighting the city was awarded, Sept. 3, to the Kenton Gas and Electric Light company for a term of five years with not less than 110 arc lights, 2,000 c. p., at $75 per light per year.

Kirkwood, Minn.—Bids are asked for until Oct. 16 for building an electric lighting plant.

Brighton, Ia.—The question of issuing bonds for an electric light plant will be voted on.

New Britain, Conn.—The question of establishing a municipal electric light plant is being considered.

Columbus, O.—Estimates are being secured for an electric light plant to furnish lights for the city.

Two Rivers, Wis.—The contract for the electric light plant was awarded to G. P. Miller & Co. of Chicago.

Iola, Kan.—The contract for building an electric light plant was awarded to E. M. Reed of Kansas City for $8,294.10.

Atlanta, Ga.—The Atlanta railway company has been authorized to construct and equip an electric lighting system in this city.

South Glens Falls, N. Y.—A fifty-year franchise has been granted the United Gas Electric Light and Fuel company for furnishing twenty-four 2,000 c. p. arc lamps at $2,400 per year.

Fredericksburg, Va.—The contract for an electric light plant was awarded Sept. 20 to Kingsbury, Samuel & Co. of Baltimore for $9,994.

St. Louis, Mo.—The Welsbach Light company has notified the city authorities that it desires to submit a bid for street lighting at the expiration of the contract with the electric lighting company, which expires May 1, 1901.

Florence, Ala.—Edward J. O'Brien has proposed to the city council to put in an electric light plant, the franchise to run 40 years, agreeing to furnish street lights at $60 per light at any time within the limit of the franchise.

PARKS.

Providence, R. I.—A park is proposed for the West Side.

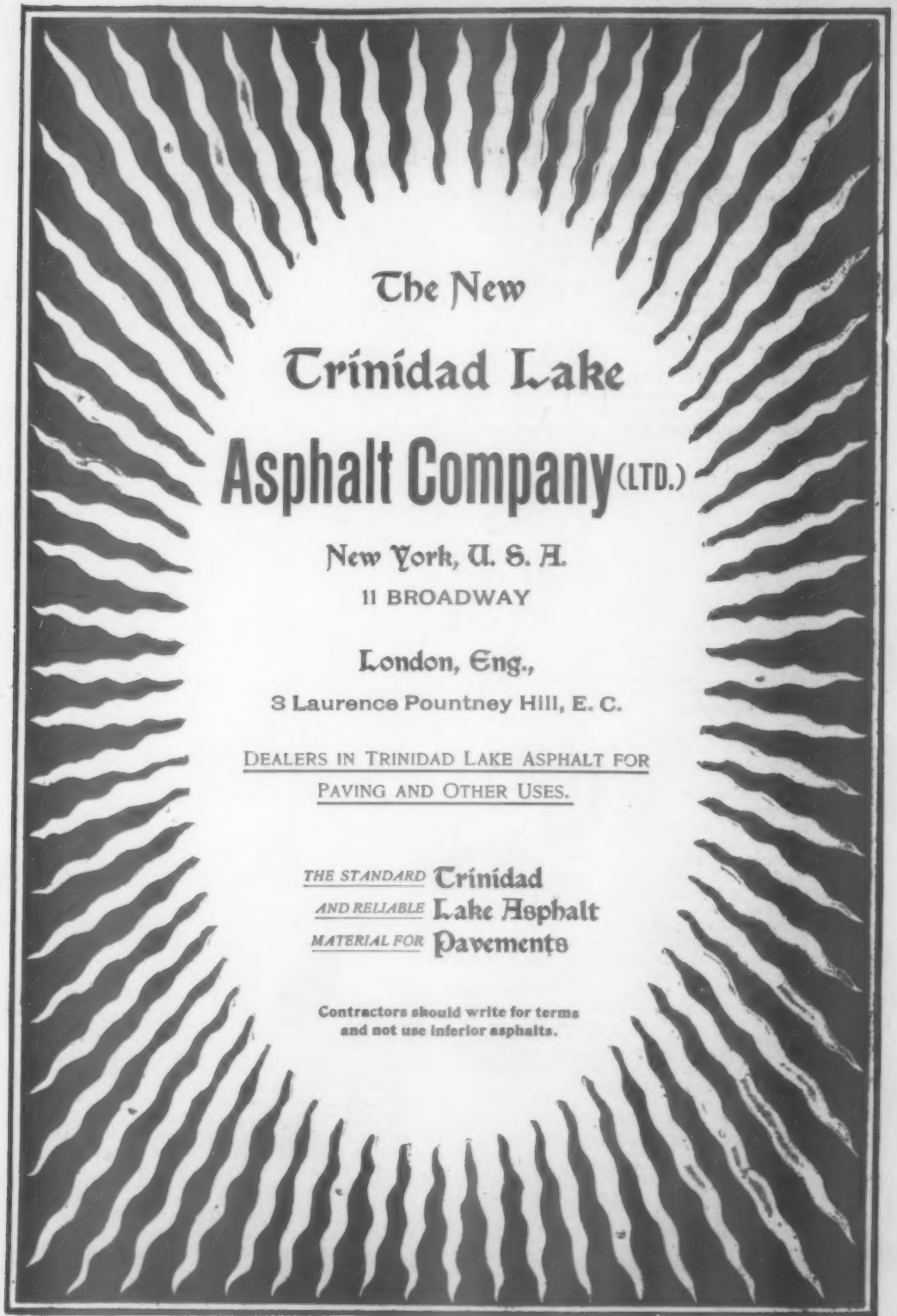
Evansville, Ind.—The council has passed an ordinance authorizing the board of public works to purchase the Armstrong property for Sunset park extension.

TOO LATE FOR CLASSIFICATION

Laurel, Md.—(Special)—The contract for building a water works system was awarded, Sept. 20, to Rosser & Castoe, of Bellaire, O., for $17,836.90. The contract for furnishing hydrants was awarded to Frank Dilks & Co., of Baltimore, for $1,513.60.

Indianapolis, Ind.—Sealed bids will be received until Oct. 12 for building the superstructure and substructure of a bridge on Pleasant-st., at Emerson-ave., in Irvington. John McGregor, chrmn. co. com'rs.

Indianapolis, Ind.—A resolution was adopted, Sept. 26, providing for asphalt paving and curbing on Louisiana-st., from Illinois-st. to Capitol-ave. Final action was taken for gravel roadway and walks on Raymond-st., from Bluff-ave. to Daisy-st.; cement walks and curbing on Elder-ave., from Maryland-st. to first alley south; cement walks on Arrow-ave., from Hillside-ave. to Valley-st.



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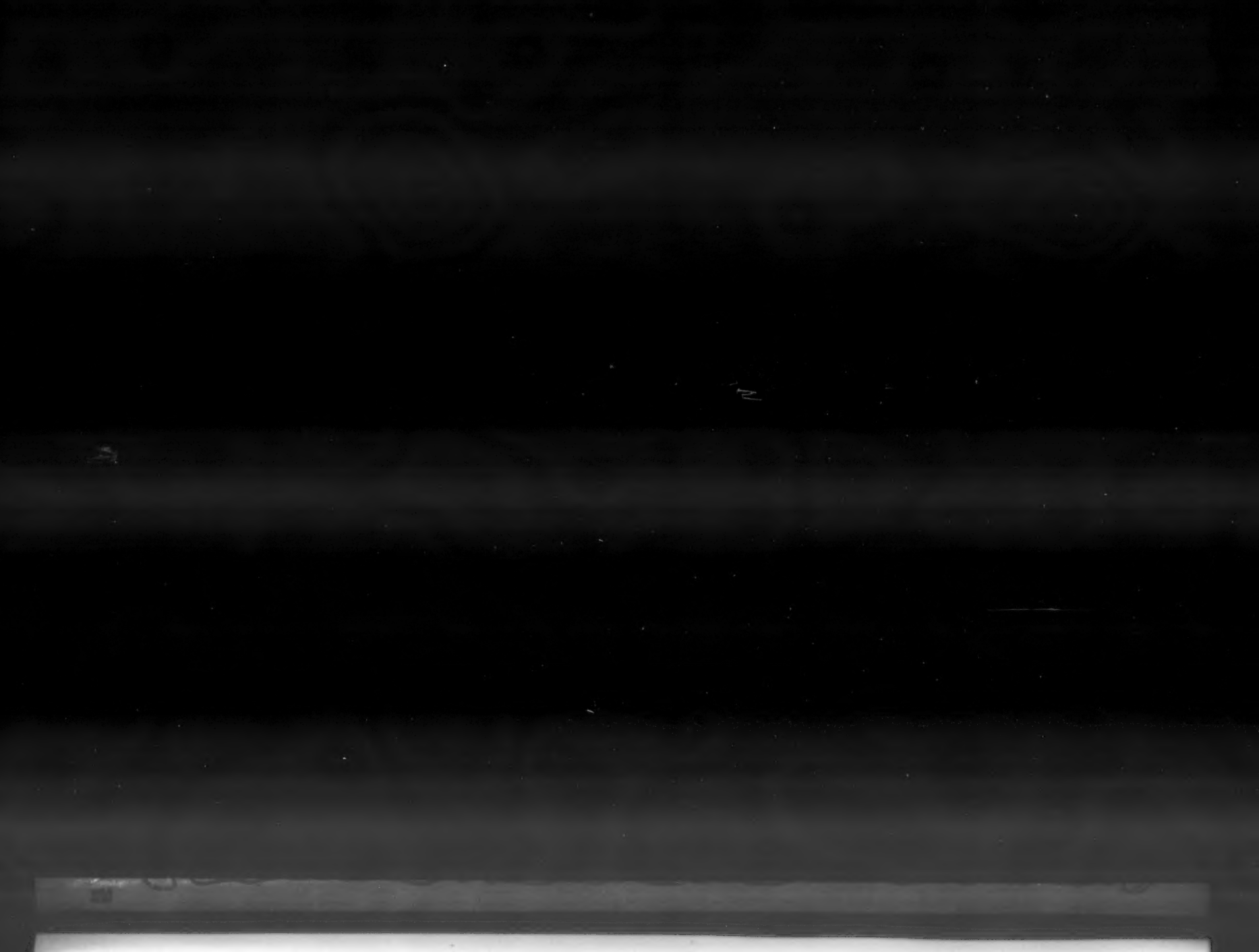
Contractors should write for terms and not use inferior asphalts.